

# HORTICULTURAL ABSTRACTS.

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Initialled abstracts in the present number are by E. W. Hobbis of the Long Ashton Research Station, and by R. J. Garner and A. M. Massee of the East Malling Research Station.

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## Horticultural Abstracts

Vol. IX

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## MISCELLANEOUS.

*Plant hormones.\**

1099. THIMANN, K. V.

577.15.04

**Auxins and the inhibition of plant growth.***Biol. Rev.*, 1939, 14 : 314-37, bibl. 130.

The author considers in turn the inhibiting effect of auxins on shoots, roots, and buds and the mechanism of inhibition. In the last section he discusses the following theories : (1) Auxin formation is prevented by the auxin applied. (2) Inhibition is due to too high an auxin concentration. (3) Inhibition is due to diversion of food supply. (4) Inhibition is due to diversion of other growth factors. (5) Inhibition is due to diversion of the auxin precursor. (6) Auxin clogs the channels of transport. (7) Inhibition is due to two streams of auxin moving in opposite directions. (8) Inhibition is the result of increased growth elsewhere. (9) A special inhibiting influence is set free by auxin. That all these theories are open to some objection is shown by the author, who points out that none of them is quite adequate to explain both the inhibition of buds and that of young growing shoots.

1100. ZIMMERMAN, P. W., AND HITCHCOCK, A. E.

577.15.04

**Experiments with vapors and solutions of growth substances.***Contr. Boyce Thompson Inst.*, 1939, 10 : 481-508, bibl. 16.

The experimental results reported involve 54 physiologically active substances that are designated as growth substances, of which 26 are being reported for the first time. There are many qualitative differences in responses induced by the 54 substances, but all have in common the capacity to produce epinasty in tomato leaves. By exposure to vapours of growth substances many species of plants were induced to form adventitious roots on leaves, stems, roots and cuttings. Phenyl growth substances applied in vapour form broke the rest period of dormant potatoes in contrast with the naphthalene substances which inhibited bud growth. Vapours of methyl and ethyl  $\alpha$ -naphthaleneacetate caused parthenocarpic development in holly berries without opening of the buds, the parthenocarpic development of the ovaries of fuchsia and enlargement of the receptacle in strawberries. The naphthalene substances were more effective than indole and phenyl compounds for inducing parthenocarpy. [From authors' summary.]

1101. ZIMMERMAN, P. W., HITCHCOCK, A. E., AND WILCOXON, F.

577.15.04

**Responses of plants to growth substances applied as solutions and as vapors.***Contr. Boyce Thompson Inst.*, 1939, 10 : 363-76, bibl. 27.

Twenty-nine compounds, physiologically active as plant growth substances when applied in solution, were found to be active also when applied as vapour, producing in the subjects all the responses previously reported for these compounds when applied as solutions, sometimes within thirty seconds.

\* See also 1168, 1188, 1200, 1293, 1315.



1102. DENNY, F. E. 547.313.2 : 581.144.4

**Leaf-epinasty tests with chemical vapors.**

*Contr. Boyce Thompson Inst.*, 1939, 10 : 191-5, bibl. 5.

Experiments with 77 volatile chemicals not previously tested for ability to produce epinasty of potato leaves (only 3 gave positive responses) and with other volatile chemicals which have been shown to cause epinasty indicated that the effective constituent derived from plant tissue is ethylene and not any of the other epinasty-inducing volatile chemicals tested.

1103. CRAFTS, A. S. 581.11 : 632.8 + 577.15.04

**Movements of viruses, auxins and chemical indicators in plants.**

*Bot. Rev.*, 1939, 5 : 471-504, bibl. 105.

A brief account is given of the work of different authorities in these three distinct fields. The problems common to all three aspects are set out clearly and the conclusion is reached that a frank recognition of the complex interrelations of structure and functions in translocation processes is essential for their comprehension. [It is a little disappointing to find that Roach's\* work on tree injection which is based on practical application of work on the path of solutes in the plant is not mentioned.—ABTRACTOR.]

1104. WENT, F. W., AND WHITE, R. 577.15.04

**Experiments on the transport of auxin.**

*Bot. Gaz.*, 1939, 100 : 465-84, bibl. 4.

A new technique involving an adaptation of the photokymograph recording of the *Avena* test for measuring the velocity and capacity of the transport of growth-promoting substances through different plant tissues has been worked out at the California Institute of Technology, Pasadena. Using this technique the following observations were made. Transport velocity is independent of length of tissue, but the amount transported decreases with increased length of coleoptile section. Transport through the narrow or wide side of a coleoptile is practically the same. The polarity of indoleacetic acid transport was more pronounced than previous work had indicated and in these experiments leakage along moist surfaces was nearly excluded. The great differences in transport velocity among the different growth-promoting substances, the differences in the rate of the growth reaction and the limited transport capacity of the coleoptile cells are responsible for the wide variation in the apparent growth activity of these substances in the *Avena* test.

1105. HITCHCOCK, A. E., AND ZIMMERMAN, P. W. 577.15.04

**Comparative activity of root-inducing substances and methods of treating cuttings.**

*Contr. Boyce Thompson Inst.*, 1939, 10 : 461-80, bibl. 10.

Treatment of cuttings with root-inducing substances applied as relatively dilute solutions (1 to 80 mg./l.), as concentrated solutions (1 to 20 mg./cc.) and as powders (0.5 to 50 mg./g.) produced essentially the same rooting response. Concentration of requirements for optimum rooting varied according to the kind and form of substance, the kind of carrier or solvent, plant species, age and relative activity of shoot, time of year of treatment, method of application. [From authors' summary.]

1106. WENT, F. W. 577.15.04 : 581.144.2

**The dual effect of auxin on root formation.**

*Amer. J. Bot.*, 1939, 26 : 24-9, bibl. 26.

Etiolated pea stem cuttings were the experimental material. Phenylacetic acid was found not to be in itself a root-forming substance. Two distinct phases in root formation could be distinguished. The first phase of the auxin action is tentatively identified with redistribution

\* A.R. East Malling Res. Stat. for 1933 and subsequent years, and Plant injection for diagnostic and curative purposes. *Tech. Commun. imp. Bur. Hort. Plant. Crops* 10, 1938, 5s.

of rhizocaline within the stem. This phase can be induced not only by indoleacetic acid but also by phenylacetic acid,  $\gamma$ -phenylbutyric acid, sodium naphthol sulfonate, and other substances, not active in root formation proper. The second phase can be induced only by indoleacetic acid and similar substances, and it has been suggested that this phase is the activation of the accumulated rhizocaline. [From author's summary.]

1107. ZIMMERMANN, P. W., AND HITCHCOCK, A. E. 577.15.04 : 612.014.44  
**Activation of cinnamic acid by ultra-violet light and the physiological activity of its emanations.**

*Contr. Boyce Thompson Inst.*, 1939, 10 : 197-200, bibl. 6.

Commercial cinnamic acid is a relatively inactive compound for inducing curvatures but it can be activated by ultra-violet light. The *cis* form results from irradiation, and is the active form. When applied to plants as water solution or lanolin preparations this compound induces responses similar to other growth substances reported in earlier publications. In addition, the irradiated cinnamic acid induces epinastic responses of plants similar to ethylene gas when the crystals are set under a bell jar with the plants. [Authors' summary.]

1108. ROBBINS, W. J., AND SCHMIDT, M. B. 577.15.04  
**Further experiments on excised tomato roots.**  
*Amer. J. Bot.*, 1939, 26 : 149-59, bibl. 18.

Light brown sugar was found to be better for growth of excised tomato roots than pure cane sugar in a solution containing sugar, minerals and thiamin. Observations on growth indicate the existence of a growth substance necessary for cell elongation in roots. Evidence is given suggesting the presence of an unknown growth substance in samples of maltose. [From authors' summary.]

1109. BAUSOR, S. C. 577.15.04  
**A new growth substance,  $\beta$ -naphthoxyacetic acid.**  
*Amer. J. Bot.*, 1939, 26 : 415-18, bibl. 16.

The synthesis of a new growth substance,  $\beta$ -naphthoxyacetic acid, is detailed and its properties are described. Its activity in lanolin paste on intact stems and leaves of tomato and other plants is noted. Root formation was increased by its use in aqueous solution on cuttings of *Coleus Blumei* but not in the case of *Taxus cuspidata*. Sodium and potassium  $\beta$ -naphthoxyacetates were also found to be active.

1110. GUSTAFSON, F. G. 577.15.04 : 581.145.2  
**Auxin distribution in fruits and its significance in fruit development.**  
*Amer. J. Bot.*, 1939, 26 : 189-93, bibl. 15.

The work dealt with here was carried out on the fruits of a number of plants at the Kerckhoff Laboratories of the California Institute of Technology. Among fruits used were tomatoes, peppers, squashes, cucumbers, etc. It was found that the auxin content of ovules and developing seeds is much greater than that of other parts of fruits and there are indications, though as yet no proof, that they produce auxin. Auxin, other than that added artificially, is found in fruits produced by treating the flower with phenylacetic acid. The rôle of auxin in the growth of fruits is discussed. It seems likely that in some fruits there is enough auxin present for continued growth, after it has once been initiated, even in the absence of seeds, whereas in others it is insufficient for this purpose. In normal fruits, in which pollination and fertilization are necessary, a reasonable hypothesis is that the initiation of growth of the ovary into a fruit results from the auxin brought into it by the pollen tubes. Although in the present experiments there was no indication of increased auxin after pollination the phenomenon has been reported elsewhere in flowers of *Cucurbita Pepo*, *Cucumis sativus* and *Helianthus annuus*.



1111. THIMANN, K. V., AND SCHNEIDER, C. L. 577.15.04  
**The relative activities of different auxins.**  
*Amer. J. Bot.*, 1939, 26 : 328-33, bibl. 15.

The activities of six pure auxins in promoting growth were compared with that of indole-3-acetic acid. They were  $\alpha$ -naphthaleneacetic acid, indole-3-butyric acid, indole-3-propionic acid, phenylacetic acid, benzofuran-3-acetic acid and  $\gamma$ -phenylbutyric acid. The measurements which are here tabulated were taken on straight growth and curvature in *Avena* and *Pisum*.

1112. DOAK, B. W. 577.15.04  
**The use of hormones as an aid to the propagation of plants.**  
*N.Z. J. Sci. Tech.*, 1939, 20 : 269A-80A, bibl. 16.

The author confirms by experiment the effects of various root-growth substances on the rooting of cuttings as already recorded by other workers. There is a brief review of the work of some of them. It is concluded that they can only be regarded as an aid and cannot replace the skill of an experienced propagator.

1113. AMLONG, H. U., AND NAUNDORF, G. 577.15.04 : 635.1/7 + 633.8  
**Wuchsstoffe und Pflanzenertrag. (Growth stimulants as affecting plant yields.)**  
*Forschungsdienst*, 1938, 7 : 465-82, bibl. 17.

Studies were made at Greifswald of the effect of growth stimulant treatments on germination, growth and yields of agricultural and horticultural plants. The following notes are taken from the summary. *Sugarbeet*. Soaking the seed for 24 hours in 0.001 and 0.01 mol solutions of potash salts of  $\beta$ -indolylacetic acid,  $\beta$ -indolylbutyric acid and  $\alpha$ -naphthylacetic acid gave in each case a considerable increase of root and leaf weight. 0.001 mol solution of  $\alpha$ -naphthylacetic acetate of potash resulted in the greatest increases (root weight 64.2%, leaf weight 59.0%). It is shown that this seed soaking treatment is a commercial proposition. Spraying the planted beets with 0.025% Belvitan solution (8 applications) resulted chiefly in an increase in leaf weight. Soaking the seed in different Belvitan solutions resulted in a greater germinating capacity and vitality of seedlings in the majority of the 30 plants tested. Its effect was particularly noticeable in artemisia, cucumber, daphne, and winter endive. The germination results depended on the amount of the growth stimulants used, the age of the seed and the season. Belvitan had a particularly favourable effect on a large number of herbs, which are specified. The amount required for optimum growth was not the same for all species. The treatment of the seed with Belvitan resulted in a dry weight increase which was greater in the roots than in the shoots.

1114. BONNER, J., AND KOEPFLI, J. B. 577.15.04  
**The inhibition of root growth by auxins.**  
*Amer. J. Bot.*, 1939, 26 : 557-66, bibl. 31.

Auxins, which exert a stimulating effect on the growth of stems, petioles, etc., are found in the same concentrations to exact a reverse effect on the growth of roots. Some of the results of work on this subject by the authors at the California Institute of Technology, Pasadena, in the past two years, are presented here.

1115. STEWART, W. S. 577.15.04  
**A plant growth inhibitor and plant growth inhibition.**  
*Bot. Gaz.*, 1939, 101 : 91-108, bibl. 14.

There is shown to be an ether-extractable substance in the cotyledons and leaves of radish plants that is capable of causing growth inhibition and positive *Avena* coleoptile curvatures. The inhibitor has no acidic or basic groups and can readily be hydrolysed to form a growth-promoting substance which from molecular weight determination by the diffusion technique is possibly indoleacetic acid. The author comments on the interest of speculation as to the likelihood of the diffusing auxin originating by hydrolysis of the inhibitor in the cotyledons. The work was done at the California Institute of Technology, Pasadena.

1116. WENT, F. W.

577.15.04 : 581.144

**Some experiments in bud growth.***Amer. J. Bot.*, 1939, 26 : 109-17, bibl. 17.

In experiments with etiolated pea shoots the phenomenon of increasing inhibition with increasing distance between inhibited lateral bud and inhibiting agent is confirmed with application of indoleacetic acid at different distances from the lateral bud. The inhibiting effect of some non-auxins and substances with low growth activity is described. The most important experiments were carried out with short pieces of stem (30-50 mm. long), carrying one lateral bud. They were cut off the plant at various times after decapitation and application of various substances. The experiments show that the indoleacetic acid and  $\gamma$ -phenylbutyric acid caused an accumulation of bud growth factors just below their point of application and that they did not inhibit growth by themselves. The experiments show very clearly that the inhibition is a secondary effect of the applied auxin. Some cases of inhibition of the apical bud by lateral buds are described. Finally, it is shown that bud inhibition can be brought about in roots which regenerate buds on their basal cut surface in much the same way that it can be brought about in stems. [Author's summary.]

1117. GUTHRIE, J. D.

633.491 : 577.15.04

**Inhibition of the growth of buds of potato tubers with the vapor of the methyl ester of naphthaleneacetic acid.***Contr. Boyce Thompson Inst.*, 1939, 10 : 325-8, bibl. 17.

The methyl ester of naphthaleneacetic acid inhibits the growth of buds of potato tubers, and is sufficiently volatile at room temperature (25° to 28° C.) that it can be introduced into intact tubers in the vapor form. The sprouting of whole tubers can be retarded by merely storing them in the presence of paper impregnated with the ester. The growth of the buds was successfully inhibited by storing the tubers in a paper bag, the inside of which had been sprayed with the chemical. The methyl ester of naphthaleneacetic acid also induces epinasty of tomato leaves when a piece of filter paper containing a small amount of the substance is placed in a bell jar with the plant. [Author's summary.]

1118. MITCHELL, J. W., AND BRUNSTETTER, B. C.

577.15.04

**Colorimetric methods for the quantitative estimation of indole-3-acetic acid.***Bot. Gaz.*, 1939, 100 : 802-16, bibl. 10.

The purpose of these investigations at U.S. Horticultural Station, Beltsville, Maryland, was to develop a means of determining the amount of indoleacetic acid that cuttings, whole plants or parts of plants absorb when placed in an aqueous solution of this substance. Of the colorimetric methods studied the nitrite test (described) proved to be applicable for the determination of indoleacetic acid in aqueous solutions having a range of concentration from 0.01 to 0.15 mg. per c.c. The ferric chloride-sulphuric acid and the ferric chloride-hydrochloric acid tests are also described. In the former the range of concentration determinable was less and in the latter the colour produced was not stable.

1119. AVERY, G. S., CREIGHTON, H. B., AND HOCK, C. W.

577.15.04

**A low cost chamber for phytohormone tests.***Amer. J. Bot.*, 1939, 26 : 360-5, bibl. 3.

A chamber is described [said to cost about \$50 to construct] for use in the *Avena* test for plant growth substances. It permits perfect humidity control if kept in a temperature-controlled darkroom and thus obviates expensive humidity control equipment and maintenance expense. The chamber is large enough to care for 8 or 9 racks of *Avena* seedlings (each holding 12 plants) in water culture. Several control chambers may be housed in a single darkroom. Schedules are given for the "deseeded" and "standard" *Avena* methods (Skoog and Went) as used in comparative tests in the new control chamber and in the usual constant-temperature constant-humidity test room. The results of such tests on more than 100 dozen test plants are included. [Authors' summary.]



1120. DEMORTIER, G. 577.05.14  
Appareil permettant de déterminer approximativement la quantité d'hormones pénétrant dans les boutures. (**An apparatus for approximate determination of the quantity of hormones penetrating into cuttings.**) [Flemish, French and English summaries.]  
*Bull. Inst. agron. Gembloux*, 1939, 8 : 43-51.
- This small apparatus mainly consists of a horizontal tube containing the solution to be studied. Another tube, fixed on its side, is intended for introducing the liquid. The cutting is placed in this second tube; a cotton-wool stopper holds it in position, and also reduces evaporation. The loss of water through the stopper can be approximately estimated by means of a few other check tubes (0.06 g. in 24 hours). The quantity of hormones absorbed by the cutting through the action of photosynthesis and evaporation during the time considered, can be known approximately by weighing. The apparatus is light and steady (it is provided with three small feet); its cost is low. It is also convenient for other experiments. [Author's summary.]
1121. ADDICOTT, F. T., AND DEVIRIAN, P. S. 577.15.04  
**A second growth factor for excised pea roots : nicotinic acid.**  
*Amer. J. Bot.*, 1939, 26 : 667-71, bibl. 16.
- BONNER, D. M., HAAGEN-SMIT, A. J., AND WENT, F. W. 577.15.04  
**Leaf growth hormones. I. A bio-assay and source for leaf growth factors.**  
*Bot. Gaz.*, 1939, 101 : 128-44, bibl. 13.
- CHADWICK, L. C., AND KIPLINGER, D. C. 577.15.04  
**Effect of synthetic growth substances on the rooting and subsequent growth of ornamental plants.**  
*Proc. Amer. Soc. hort. Sci. for 1938*, 1939, 36 : 809-16, bibl. 8.
- DEFRANCE, J. A. 577.15.04  
**Effect of synthetic growth substances on various types of cuttings of *Arctostaphylos Uva-ursi*.**  
*Proc. Amer. Soc. hort. Sci. for 1938*, 1939, 36 : 800-6, bibl. 9.
- DEFRANCE, J. A. 577.15.04  
**Propagation of *Sciadopitys verticillata* with root inducing substances.**  
*Proc. Amer. Soc. hort. Sci. for 1938*, 1939, 36 : 807-8, bibl. 5.
- GARDNER, F. E., AND MARTH, P. C. 577.15.04  
**Effectiveness of several growth substances on parthenocarp in holly.**  
*Bot. Gaz.*, 1939, 101 : 226-9, bibl. 4.
- GOODWIN, R. H. 577.15.04  
**Evidence for the presence in certain ether extracts of substances partially masking the activity of auxin.**  
*Amer. J. Bot.*, 1939, 26 : 130-5, bibl. 14.
- LONGLEY, L. E. 577.15.04  
**Effect of growth substances and maturity on rooting of cuttings of certain shrubs.**  
*Proc. Amer. Soc. hort. Sci. for 1938*, 1939, 36 : 827-30.
- MITCHELL, J. W., AND STUART, N. W. 577.15.04 : 635.65  
**Growth and metabolism of bean cuttings subsequent to rooting with indoleacetic acid.**  
*Bot. Gaz.*, 1939, 100 : 627-50, bibl. 14.
- NAGAO, M. 577.15.04  
**Studies in the growth hormone of plants. IV. Further experiments on the production of growth substance in root tips.**  
*Sci. Rep. Tôhoku Imp. Univ.*, IV Ser. (Biology), 1938, 13 : 221-8. Abstract 16 lines *Jap. J. Bot.*, 1939, 10 : (15).

- SHIBUYA, T. 577.15.04 : 581.143.26.03  
**Preliminary studies on the response of seeds to the hormone treatment giving vernalization effect.**  
*J. Soc. trop. Agric. Taiwan*, 1938, 10 : 264-9, abstract 9 lines *Jap. J. Bot.*, 1939, 10 : (21).  
 SHIBUYA, T. 577.15.04 : 631.531  
**The effect of auxin on the germination of seeds.**  
*J. Soc. trop. Agric. Taiwan*, 1938, 10 : 270-3, abstract 4 lines *Jap. J. Bot.*, 1939, 10 : (21).  
 STOUTEMYER, V. T. 577.15.04  
**Tale as a carrier of substances inducing root formation in softwood cuttings.**  
*Proc. Amer. Soc. hort. Sci. for 1938*, 1939, 36 : 817-22, bibl. 3.  
 ZIMMERMAN, P. W., and HITCHCOCK, A. E. 577.15.04  
**Effect of several growth substances on various storage organs.**  
*Proc. Amer. Soc. hort. Sci. for 1938*, 1939, 36 : 796-9. To be published in full in *Contr. Boyce Thompson Inst.*

*Photoperiodism.*

1122. HITCHCOCK, A. E., AND ZIMMERMAN, P. W. 612.014.44 : 635.64  
**Unusual physiological responses induced on intact plants by capping with black cloth.**  
*Contr. Boyce Thompson Inst.*, 1939, 10 : 389-98, bibl. 11.  
 Capping the upper part of tomato plants with black cloth for periods of 3-14 days induced all the physiological responses characteristic for applied growth substances such as indoleacetic acid, indolebutyric acid, naphthaleneacetic acid and ethylene in concentrations of 1 : 500 p.p.m. From the magnitude of the responses it is concluded that they are brought about by an increase in the production of natural hormones and not entirely as a result of a redistribution of the existing hormones during dark treatment.
1123. HAMNER, K. C., AND LONG, E. M. 612.014.44 : 635.24  
**Localization of photoperiodic perception in *Helianthus tuberosus*.<sup>1</sup>**  
*Bot. Gaz.*, 1939, 101 : 81-90, bibl. 11.  
 Grafting experiments are described from the results of which it is concluded that Jerusalem artichokes are photoperiodically induced in relation to tuber formation.
1124. SUGAWARA, T. 577.16 : 612.014.44  
**Studies on the formation of ascorbic acid (vitamin C) in plants. 1. The influence of light on the ascorbic acid contents in various etiolated seedlings.**  
*Jap. J. Bot.*, 1939, 10 : 141-50, bibl. 22.  
 Experiments were made on the effect of artificial illumination on the ascorbic acid content of seedlings of spinach, lettuce, Chinese cabbage, tomato, garden pea and other plants. A number of etiolated seedlings 5 days old were continuously exposed to light at 1,000 lux for 48 or 96 hours, while the controls were kept in a dark room. Results proved that the germination of seeds even in the dark produces a considerable amount of ascorbic acid. It was, however, found that the amount of ascorbic acid in the leaves was affected by light, being in fact directly proportional to increase in light intensity within the limits of the experiment.
1125. LONG, E. M. 612.014.44  
**Photoperiodic induction as influenced by environmental factors.**  
*Bot. Gaz.*, 1939, 101 : 168-87, bibl. 12.



1125. PARKER, M. W., AND BORTHWICK, H. A. 612.014.44 : 635.655  
**Effect of variation in temperatures during photoperiodic induction upon initiation of flower primordia in Biloxi soybean.**  
*Bot. Gaz.*, 1939, 101 : 145-67, bibl. 13.  
 PARKER, M. W., AND BORTHWICK, H. A. 614.014.44 : 635.655  
**Effect of photoperiod on development and metabolism of the Biloxi soybean.**  
*Bot. Gaz.*, 1939, 100 : 651-89, bibl. 14.

*Cosmic rays.*

1126. BECKER, A. 581.057 : 581.14  
 Mond und Pflanzenwachstum. (**Moon as affecting plant growth.**)  
*Obst- u. Gemüoseb.*, 1939, 85 : 102.

Exact experiments were carried out at the State Botanical Institute at Munich in 1937 and 1938 and seed sown on days designated as favourable or unfavourable in the so-called Moon Calendar of Lorenz and Bauer. Otherwise the plants were treated in a normal manner. Results showed clearly that radish, common radish, cucumber, tomato and certain other plants produced equally good crops irrespective of whether the day of sowing was "favourable" or not. The writer concludes with a denunciation of the danger of encouraging belief in the so-called cosmic influence on plant growth.

*Water culture.*

1127. HAMPE, P. 663.61 : 581.084.1  
 Culture dans l'eau. (**Water culture.**)  
*Rev. hort. Suisse*, 1939, 12 : 49-55.

This is a semi-popular account of the water culture experiments carried out by M. Georges Truffaut at Versailles with whom the author collaborated. Wooden tanks 1 m. 30 × 30 cm. and 25 cm. deep lined at first with a bituminous sheet called calandrite formed the receptacles. Later these tanks were lined with sheet iron painted with bitumen. The plants rested on expanded metal trays supported on wooden battens 5 cm. below the top of the tank. The whole was covered with fibro-cement slabs in which holes had been cut to take the plant stems. Tomatoes and cucumbers were first grown. With these and all other plants it is essential that the roots only and not the collar of the plant should be in the solution. The plant roots are enveloped in peat in small wire baskets which are placed on the trays and they make their way down to the solution through the peat. Losses occur if the roots are left bare at the start, unless the troublesome procedure of spraying them daily with nutrient solution is adopted. The preliminary packing in peat avoids this. Light must be kept from entering the tanks or troublesome green algae will develop. The composition of the solution is naturally of the utmost importance. The following gave excellent results. Grammes per litre of water ammonium-mono-hydrogen phosphate 0.142, magnesium sulphate 0.284, potassium nitrate 0.568, calcium nitrate 0.710, ferric chloride 0.112, potassium iodide 0.00284, boric acid 0.00056, zinc sulphate 0.00056, manganese sulphate 0.00056. pH should be about 6. The solution is replenished daily by the addition of a solution containing a total of 1 gramme per litre of the salts mentioned. Optimum temperatures for root production vary with the plant variety ; 25-30° C. suits tomatoes and cucumbers but is too high for dahlias, chrysanthemums and potatoes. In this case the solution temperature was maintained by electrical control. Results were striking ; tomatoes reached a height of 4 metres in 110 days, were 7-9 storeys high against the 3-5 of soil-grown controls and bore 5-7 kg. of fruit of normal size and flavour per plant, a record for the variety, Gloire de Versailles. The cucumber and potatoes did equally well. In fact it is suggested that any plant which has the habit of rapid root growth succeeds. Those which have a slow rooting process, e.g. carnations, are more successful when their roots are in coarse sand to which the solution has access.

1128. HAMPE, P. 663.61 : 581.084.1  
Nouvelles suggestions concernant les cultures dans l'eau. (**Water culture notes.**)  
*Rev. hort. Suisse*, 1939, 12 : 153-4.

In water cultures some plants, e.g. the melon, object to the moisture of the solution round the collar. Such plants can be grown successfully if placed in a small metal basket filled with peat and supported over the culture medium on wooden battens which are partially submerged. The roots emerge from the basket and enter the solution by way of the battens to which they press closely. In a previous trial, in which the basket was supported on a perforated metal sheet just above the solution, few roots could be induced to enter, because there was nothing for them to cling to on the way down.

#### *Nutrition.*

1129. TEAKLE, L. J. H., AND MORGAN, E. T. 631.811.9  
**Recent experiments with minor elements in Western Australia.**  
*J. Dep. Agric. W. Aust.*, 1939, 18 : 116-28, bibl. 23.

A series of 4 short papers dealing with the value of the minor elements to plant growth in Western Australia. Only the first two papers concern this Bureau.

I. *A brief review of the minor element question in Western Australia.* The soils of W. Australia are of an extremely patchy nature. It has been recognized from the time of the earliest settlers that nearly all require liberal manuring but it is only recently that the importance of the minor elements has been recognized. A variety of crops show marked response to copper on certain acidic soil types, to manganese on marly peat, etc. On the other hand a number of experiments have had no results or have damaged the crop. At present lack of precision in the information necessitates the greatest care.

II. *Experiments with minor elements on the growth of potatoes, vegetables and pastures.* On certain marly peat soils manganese sulphate benefited potatoes, beans, cabbage, swedes, turnips, tomatoes and peas; copper sulphate in addition to manganese improved cabbages, swedes, turnips, tomatoes and peas. The value to the peas lay in the formation of well-filled pods instead of the usual empty pods when only H\* manure was used. With potatoes on a black acidic-sandy muck, which was naturally very productive, the addition of commercial sulphates of copper, manganese, zinc, magnesium and borax to the complete fertilizer at the rate of 20 lb. each per acre increased the yield, reduced the need for heavy dressings of complete fertilizer and eliminated stem-end rot from the tuber. In a copper-deficient land the effect of added copper on potatoes is to increase vigour of foliage, render the stems thicker and more erect with a strong development of branches and subsidiary stems and to increase and prolong the flowering; the leaves are a paler green than those of the control; the tubers are cleaner and healthier and the eye stronger and more deeply set. On sprouting pink sturdy shoots develop and the crop resulting from seed from plots receiving copper reflects the extra quality of the seed.

1130. TRENEL, M. 631.811.9  
Die Bedeutung der Spurenelemente für die praktische Landwirtschaft.  
(**The importance of the so-called minor elements in practical agriculture.**)  
*Ernähr. Pfl.*, 1939, 35 : 42-6, bibl. 7 in text.

The effect on the health of certain plants is studied of boron, cobalt, zinc, manganese and copper deficiencies, the two last being dealt with rather more fully.

1131. THOMAS, W., AND MACK, W. B. 631.8 : 581.192 : 581.144.1  
**Control of crop nutrition by the method of foliar diagnosis.**  
*Bull. Pa agric. Exp. Stat.* 378, 1939, pp. 33, bibl. 17.

A method of leaf diagnosis is described, which is based on qualitative and quantitative determinations of the principal nutrients, N, P and K, at the moment of sampling and unlike the

\* H manure = N 4%, P<sub>2</sub>O<sub>5</sub> 13.7%, K<sub>2</sub>O 9%.



usual methods of soil and plant testing, does not require a key of interpretation. The method is illustrated from results with maize on 13 differentially fertilized field plots. The interpretation of results is shown graphically. The applications of the method to the determination of suitable experimental sites for field plots, to the selection of a properly balanced fertilizer, to the diagnosis of pathological conditions associated with nutritional disturbances, and to plant breeding experiments are described.

1132. MATSKOV, F. F., AND FARFEL, R. L. 631.8  
**Experiments on feeding agricultural plants otherwise than through their roots.**  
 [Russian.]

*Mem. Kharkov agric. Inst.*, 1939, 1 : 4 : 293-325, bibl. 15.

Yields, particularly of mangels but also of sunflower and barley, were considerably increased by spraying the crops several times, at short intervals, with solutions of certain salts.

1133. STOUT, P. R., AND ARNON, D. I. 631.8 : 546.56 + 546.711 + 546.47  
**Experimental methods for the study of the role of copper, manganese and zinc in the nutrition of higher plants.**  
*Amer. J. Bot.*, 1939, 26 : 144-9, bibl. 12.

1134. KALANTYR', M. S. 546.27  
**The effect of boron on plant fertility.** [Russian.]  
*Proc. Lenin Akad. agric. Sci., Moscow*, 1939, 15 : 17-21, bibl. 11.

In recent Russian experiments with peas and lentils boron was found to be extremely important for the normal development of generative organs of leguminous plants. The amounts of boron needed by the plants are said to be very slight. Boron deficiency in association with increased applications of lime interfered with the normal process of seed formation, and so resulted in formation of abortive fruits. Plants that were given boron with the fertilizer produced also the highest yields and bore the smallest number of fruits which had not fully developed.

1135. CELICHOWSKI, K. 546.27  
 Stosowanie boraksu pod rośliny uprawne, a specjalnie pod buraki cukrowe.  
 (Suitable boron applications for sugar beet and certain other agricultural crops.)  
 Bagatela, Warsaw, 1938, pp. 7, bibl. 14.

A survey of English, German and Polish literature dealing with boron in agriculture and horticulture.

1136. WHITE-STEVENS, R. H. 581.13 : 546.27  
**Carbohydrate metabolism in relation to boron nutrition.**  
*Proc. Amer. Soc. hort. Sci. for 1938*, 1939, 36 : 537-43, bibl. 64, being *Pap. Dep. Veg. Crops, Cornell Univ.* 136.

It is suggested that, since in boron-deficient plants carbohydrates are lacking in meristem and root, the failure to function is due to lack of energy supplied normally by respiration of carbohydrates. This slowing down of physical function is followed apparently by actual respiration collapse within the cells resulting from a lapse in the carbohydrate supply.

1137. ROBINSON, K. L. 546.27 : 581.192  
**A method for the determination of small quantities of boron in plant material.**  
 Reprinted from *Analyst*, 1939, 64 : 324-8, bibl. 2.

The method consists essentially of estimating the intensity of red colour of a turmeric reagent by means of a Lovibond tintometer. It involves prevention of volatilization of boric acid and removal of certain substances hindering the development of the turmeric red colour.

1138. STOUT, P. R., AND HOAGLAND, D. R. 581.13  
**Upward and lateral movement of salt in certain plants as indicated by radioactive isotopes of potassium, sodium and phosphorus absorbed by roots.**  
*Amer. J. Bot.*, 1939, 26 : 320-4, bibl. 5.

Radioactive isotopes of K, Na, P and Br were used at Berkeley, California, in studying the upward movement of salt in actively growing and transpiring willow and geranium plants, after absorption of these isotopes by the roots. . . . The evidence is consistent with the view that the xylem is in the path of rapid upward movement of salt. [From authors' summary.]

1139. BALKS, R. 631.811.7  
**Über die Rolle des Schwefels in der Pflanzenernährung. (On the rôle of sulphur in plant nutrition.)**  
*Ernähr. Pfl.*, 1939, 35 : 194-201, bibl. 46.

A survey of recent research led to the following conclusions :—1. Sulphur is an essential component of the proteins and other compounds formed within the cell. 2. Of these glutathionic acid, vitamin B<sub>1</sub> and mustard oil appear to be the more important. 3. The sulphate ion has a beneficial effect on the general health conditions of the plant. 4. Sulphur requirements of agricultural crops are approximately the same as those for phosphoric acid.

#### Various.

1140. ROEMER, T., FUCHS, W. H., AND ISENBECK, K. 631.523 : 632.1/8  
**Die Züchtung resistenter Rassen der Kulturpflanzen. (Breeding resistant races of cultivated plants.)**  
*Kühn Arch.*, 1938, vol. 45, pp. 427, bibliographies for each disease or pest.

After discussing the fundamentals of breeding for resistance in cultivated crops and the methods of procedure the authors deal in turn with some thirty diseases separately, indicating the point now reached by research work in each case. A large number of the diseases discussed affect cereals, and the various rusts and bunts are considered at some length. Among diseases and pests dealt with of importance to the fruit or vegetable grower are the following :—(1) Affecting vines :—*Plasmopara viticola*, *Uncinula necator*, (*Phylloxera*) *Dactylosphaera vitifolia*; (2) affecting fruit trees :—*Venturia* spp., *Eriosoma lanigerum*; (3) affecting market garden crops :—*Synchytrium endobioticum*, *Phytophthora infestans*, *Actinomyces scabies*, *Colletotrichum Lindemuthianum*, *Phytophthora Medicaginis*, *Plasmodiophora Brassicae*, *Heterodera* spp., *Tylenchus Dipsaci*, *Empoasca Fabae*.

1141. STRUCKMEYER, B. E., AND ROBERTS, R. H. 581.46  
**Phloem development and flowering.**  
*Bot. Gaz.*, 1939, 100 : 600-6, bibl. 3.

The phloem of the flowering stem differs from that of the vegetative stem in its smaller amount, in the smaller size of the sieve tubes and companion cells, in the thicker cell walls, in some species in the crushed cell walls, in the formation of parenchyma adjacent to the cambial region and in the increased callose present in the sieve tubes. At least three of these characters are present in each case. Changes in the details of the anatomy of the phloem have been observed within a few days of a change in environmental treatment (e.g. long day, short day) and as early as the appearance of the blossom primordia.

1142. RICHARDSON, E. G. 631.459  
**Erosion and soil conservation in theory and practice.**  
*Sci. Progr.*, 1939, 34 : 63-75.

The article begins with a discussion of the mechanism by which silt particles are carried up from the bed into the stream and kept in suspension. Apparatus and technique are described for measuring silt concentration, velocity and distribution, both in the laboratory and in a natural



river. An account is given of the experimental work of the Soil Conservation Service Stations at Marlborough and Freehold, New Jersey, U.S.A. both at the stations and in the field under co-operative agreement between the State and the farmer. In the latter case in return for following a schedule of cultivation for at least five years, admitting the officers of the Service to the land, and using only the fertilizers prescribed, the farmer gets the services of its engineers for making terraces, drainage culverts and every appurtenance of the system of erosion control which they deem necessary. The labour is supplied by youths from the Civilian Conservation Camps and is apparently paid for by the Federal Government.

## TREE FRUITS, DECIDUOUS.

### General.

1143. JORDAN, E. 634/5 : 351.823.1  
 Der Obstbau im Rechtsleben des deutschen Volkes. (**Horticultural legislation in Germany.**)  
*Forschungsdienst*, 1939, 4 : 315-52, bibl. 248.

This is a survey of German legislation for the protection of fruit growers from the earliest times up to the present day. The paper is divided into 5 sections which deal in turn with (1) damage to trees, (2) ownership of overhanging fruit both on the tree and after falling, (3) fruit theft, (4) damage to trees by animals, (5) damage to trees by industrial enterprise. There seem to be certain discrepancies regarding offence and punishment and the general legal position in different parts of Germany.

1144. BOSCHINI, G. 634.1/2  
 L'impresa frutticola nel commune di Massalombarda. (**The economics of fruit growing round Massalombarda.**) [English, French and German summaries.]  
*Riv. Frutticoltura*, 1939, 3 : 23-52, bibl. 7.

The effects of industrialization on fruit growing in the Massalombarda district are noted. Figures of employment show that whereas on farms where only 25% of the land is devoted to fruit one man will work 5.5 acres, on those almost entirely devoted to fruit a man will work only just under 3 acres. The métayer system is the most common method of contract. As used here the peasant not only supplies half the capital of animals and heavier tools, but is also part proprietor of the produce. He therefore has the treble functions of contractor, capitalist and labourer.

1145. BOSCHINI, G. 634.1/2  
 Le piantagioni frutticole nel commune di Massalombarda. (**Fruitgrowing round Massalombarda.**) [English, French and German summaries.]  
*Riv. Frutticoltura*, 1939, 3 : 89-129, bibl. 7.

In this famous and prosperous fruit district of Northern Italy a greater area is devoted to peach growing than to any other fruit crop. This is followed by pears and apples grown together, then come pears, apples, plums, peaches and pears, and various combinations. The total area under fruit is about 2,110 acres. Varieties of peach which are tending to increase are Hale and Bella di Roma Tardiva, while Triumph, Morellone and Alberta are going out of cultivation. The most popular pears are Williams and Passe Crassane. The apple varieties which are tending to come to the front or keep their popularity are Delicious, Abundance, King David, Rambour Franco, Rome Beauty and Winesap. Prices for plums remain very low, the most common now being Burbank, Rosetta di Giugno and Santa Rosa.

1146. FAURE, J. 634.25  
 La cultura del pesco nella valle del Rodano. (**Peach growing in the Rhone valley.**) [English, French and German summaries.]  
*Riv. Frutticoltura*, 1939, 3 : 131-46.

The author deals with peach growing in the valley of the Rhone from Lyons southwards to Montelimar. Some 325,000 quintals are produced yearly for the French market. Amsden still remains the most popular variety, but the yellow-fleshed J. H. Hale is steadily gaining ground.

1147. ŽUBECKIS, E. 634.11 : 551.56  
 Latvijas 1936 gada ražas Antonovka. (**The Antonovka apple in Latvia.**)  
 [German summary 1 p.]  
*Latvian J. agric. Res.*, 1939, 4/5 : 454-75.

This article is in continuation of one dealing with the outward characters and chemical constitution of Antonovka apples in Latvia in 1935 (*Acta Univ. Latv. Lauksaimniecības fakultātes*, ser. III, 7). In the previous article it had been shown that astonishing differences were apparent in apples from different trees and different places. These differences are found to depend fundamentally on the assimilation of carbohydrates and on respiration, and the rhythm of these processes is regulated by the climatic factors of aeration, warmth and moisture. The effect of the very different weather experienced in the two years 1935 and 1936 on the value of the Antonovka crop is discussed. In 1936 the air temperature was appreciably higher, there was more sunshine, but less rain and a lower relative air humidity. As a result the apples were better coloured, bigger and heavier. They were, when picked at the same date, physiologically riper.

1148. HINE, E. 634.38  
 Alguas notas sobre el cultivo de la morera. (**Notes on the cultivation of the mulberry.**)  
*Rev. agric. C.N.A. Costa Rica*, 1939, 4 : 215-24.

Several varieties of mulberry are mentioned, of which the black and the white are the principal. The white in particular has given rise to a number of seedling forms. Propagation is by seed, cuttings or grafting. Seeds are sown in frames in rows 4 inches apart and 1 inch deep and planted out when the seedlings have made 4-6 leaves. Cuttings are made from wood of the previous year cut 1 foot long and are not more than an inch thick. They are set nearly vertical in the cutting bed to half their length and covered with straw, which is moistened daily. They can also be struck in propagating frames in soil or river sand. (There is no description of grafting.) Mulberries from seed are transplanted twice before setting in permanent positions if tall well-shaped trees are required, the two years spent in the second nursery being devoted to the building up of the framework. By another method the trees are taken direct to the field without passing through the second nursery; this is when intensive planting is required. The trees in such cases are specially selected for their tendency to branch close to the base, the soil is well manured with nitrogenous fertilizers and thoroughly cultivated. Instructions are also given for forming dwarf, medium and full standard trees. This is accomplished by means of pruning systems which are described and illustrated. It is assumed that the object of mulberry growing is the production of leaves for silkworms, but notes are given of various other uses to which the tree can be put. In particular the great value of the leaves as cattle feed is stressed. They can be used equally well fresh, dried, compressed or as ensilage, 10 lb. per day being suggested as an amount suitable to balance the normal ration.

1149. HOTTA, T. 634.38  
 Contributions to the knowledge of the systematics of *Morus* in Japan. VII.  
***Morus* in cultivation.**  
*Bot. Mag. Tokyo*, 1938, 52 : 363-8, 388, abstract 3 lines in *Jap. J. Bot.*, 1939, 10 : (6).

A key for the identification of 4 species and a number of varieties and forms of each species of *Morus*.



*Breeding.*

1150. LEWIS, D., AND CRANE, M. B. 634.11 : 575.1  
**Genetical studies in apples II.**  
*J. Genet.*, 1938, **37** : 119-28, bibl. 12.

In a previous article (*Ibidem*, 1933, 28 : 265-96) Crane and Lawrence gave an account of genetical studies of fruit characters, such as colour and russetting of the skin, season of ripening, shape and size of fruit. In this article the inheritance of a purple anthocyanin character is described.

1151. CRANE, M. B., AND THOMAS, P. T. 634.13 : 575.1  
**Genetical studies in pears. I. The origin and behaviour of a new giant form.**  
*J. Genet.*, 1938, **37** : 287-99.

Genetical studies of the Fertility pear and a bud sport known as Improved Fertility.

1152. ZELENSKY, M. A. 634.13-1.531  
**Dormancy in pear seed.** [Russian.]  
*Proc. Lenin Akad. agric. Sci., Moscow*, 1939, **15** : 13-6, bibl. 10.

In 1937 and 1938 dormancy tests were made of a great number of pear varieties with different maturity dates at the Maikop Research Station, U.S.S.R. Minimum stratification period for *P. communis* seed was 37 days, when 5% of the seed germinated. Optimum stratification period was 57 days resulting in 85% germination. Similar data were obtained in stratification experiments with *P. elaeagnifolia*. The germination percentage of the seed with seed coat removed of pears of all dates of maturity was generally high, but it was particularly high for pears maturing in summer. There was a significant difference in the number of seedlings produced from the germinating seed, summer varieties producing 77%, autumn varieties 36.2% and winter varieties 18.5%. Seedlings of the summer pear varieties had on the 8th day of transplanting a considerably longer and stronger root system than late maturing varieties. The vigour of summer pear seedlings was also greater. All this tends to indicate that the seed from summer pear varieties does not undergo a dormant period, while that of late maturing varieties definitely does first pass through a dormant stage.

*Propagation.*

1153. NATIVIDADE, J. V. 634.11 : 575.252  
 Mutações somáticas nas pomóideas. (**Bud mutations in Portuguese pear and apple varieties.**) [English summary 1 page.]  
*Agronomia lusitana*, 1939, **1** : 7-21, bibl. 15.

A bud mutation in a favourite Portuguese pear, the Carapineira, and three colour mutations in the apple variety, Casa nova de Alcobaça, observed by the author in orchards near Alcobaça are described. The pear sport differs in time of maturity, which is 15-20 days later than in the type, and in size of fruits which is larger than in the type. It should be valuable. Of the apple sports, which are already growing as trees as the result of faulty selection of budwood, the first, which shows increased colour of fruit, should be useful, while the other two are less valuable than the type and should definitely be eliminated.

1154. BRADFORD, F. C., AND CARDINELL, H. A. 634.11-1.541.44  
**Practicable method of top-working large apple trees.**  
*Quart. Bull. Mich. agric. Exp. Stat.*, 1939, **21** : 184-91.

It is claimed that topworking large trees is impracticable. The grafting of large branches is accompanied by open wounds and frequently by the breaking out of the scions. The grafting of the ends of limbs under two inches in diameter is claimed to entail too much work. As an alternative to normal topworking the grafting of the sucker shoots and the bare limbs in the middle of the tree is advocated. Growth from this region is vigorous and tends upwards until it comes into cropping when it gradually bends outwards and occupies the position of the old variety, the old variety being cut away to allow of this. The method advocated is to cleft graft the sucker shoots, where suitably placed, and to graft the bare limbs as required in the following

way in the late spring when the rind lifts readily. Dormant scion wood of large size is preferred. The scion wood is cut into lengths of from two to six inches containing one or more buds. These portions are cleft along this length, or pared, so that rather more than half the scion is left. The pith is barely exposed. Where the scion is to be inlaid the outer corky part of the bark of the limb is sliced off, leaving the "fleshy" portion of the bark. The scion is laid along the limb and its outline marked by the knife. The bark is removed down to the wood within this outline and the scion placed with its cut surface against the exposed wood of the limb. The scion is held in position by two small wire nails. Parallel to the scion and about two inches from it cuts are made in the bark extending an inch or so beyond the ends of the scion. This prevents the "expansive growth force" from pulling the bark away from the edge of the scion. All cuts, except these two slits, are now covered with grafting wax. Some scions will lie dormant for a year. Care should be taken to place the scions in positions suitable for new limbs. The sides of upright limbs, where new branches will form a weak narrow crotch, are unsuitable. The exact top of diagonal or horizontal branches should be avoided. A few degrees either side of this line seems to be the best. In most cases a small number of cleft grafts will be required to furnish the ends of scaffold limbs to avoid leaving stubs. The laterals of the old variety are gradually removed, being replaced by growth from the new scions. As with all methods of top-grafting there is danger of sun-scald. If insufficient growth is present to protect the bark of the main limbs, a whitewash should be applied soon after grafting.

[The method of topworking described would appear to the Abstractor to be only applicable to trees of "umbrella" type which have limbs approaching the horizontal in the middle of the tree. Such trees generally result from lack of formative pruning and are few and far between in the majority of English fruit areas.]

R.J.G.

1155. ZAKHAROVA, E. I., AND POTAPENKO, YA. I. 634.11-1.541.44  
**Development of seedling scions grafted to the crown of bearing apple trees.**  
 [Russian.]

*Proc. Lenin Acad. agric. Sci., Moscow, 1939, 14 : 3-6, bibl. 3.*

The more important results of the experiments at the Central Genetical Laboratory, Mitchurinsk, which are described here in some detail, may be summarized as follows: (1) Two-year-old scion wood taken from certain seedlings could not be induced to flower before the normal time by grafting to the crown of fully grown, vigorous trees, var. Antonovka. (2) Scions taken from the crown of 11-year-old seedlings of a certain apple variety and worked to Antonovka trees flowered in the second year after the grafting operation. However, no flowering occurred when the scions were taken from the sucker growth of the same trees. (3) A certain relationship was established between scion wood growth and first flowering.

1156. CARDINELL, H. A. 634.11-1.541.11  
**Observations on certain coatings used in grafting the apple.**  
*Quart. Bull. Mich. agric. Exp. Stat., 1938, 21 : 123-9.*

A comparison is made, with apple trees as material, of the effect of 8 home-made and 9 proprietary grafting waxes on the percentage stand obtained and on the average growth made. The phenomenon of the wax cracking was also noted in each case. Some 5 of the commercial products proved satisfactory. Home-made wax No. 20 proved its value. Its composition is resin 5 lb., beeswax 1 lb., raw linseed oil  $\frac{1}{2}$  pint, fullers' earth  $\frac{1}{2}$  lb.

1157. MARSHALL, R. E. 634.11  
**Permanence of size differences in orchard tree.**  
*Quart. Bull. Mich. agric. Exp. Stat., 1939, 21 : 265-77, bibl. 4.*

Observations were made on a block of 180 apple trees comprising the varieties Duchess, Grimes, Stayman, Baldwin and Northern Spy, presumably on seedling stock. The author summarizes as follows:—"The nine trees in each of 20 rows involving five varieties of apples were divided into three size groups on the bases of cross-sectional areas of tree trunks and tree top volumes after the completion of two growing seasons in the orchard and the relative rates of growth of



the trees constituting the smallest trees and the class of largest trees were determined until the orchard was 15 years old. On the average, the small trees remained substantially smaller in size, as determined by rate of tree trunk growth and rate of tree top volume increases, than the large trees throughout the 15-year period and there was some indication of a tendency for the relative size differences between small and large trees to increase with increase in age of trees. Filler trees were removed at the end of 15 years and a study of annual ring increments showed that the smallest filler tree of each row at planting time was, on the average, the smallest tree when the orchard was 15 years old and that the largest filler tree of each row at planting time was the largest at the end of the experiment."

*Rootstocks.*

1158. FRIEDRICH, G. 634.11-1.541.11 : 581.192  
Der Verlauf der Zustandsindikatoren bei Apfelveredlungen. (**Chemical and physiological changes in grafted apple trees.**)  
Reprinted from *Kühn-Arch.*, 1939, 48 : 191-233, bibl. 68.

Experiments at Halle, in which the apple varieties Kaiser Wilhelm and Weisser Klarapfel were grafted on various Malling rootstocks, and Malling rootstocks were worked on themselves or other Malling stocks, showed that trees worked on dwarfing types usually contained higher concentrations of sugar and nitrogen, more dry substance and had a higher osmotic pressure than others.

1159. MANARESI, A. 634.13-1.541.11  
Intorno ad alcuni soggetti poco usati per l'innesto del pero. (**Little used pear rootstocks.**) [English, French and German summaries.]  
*Riv. Frutticoltura*, 1939, 3 : 1-22, bibl. 16.

The suitability of certain pears of eastern origin for use as rootstocks for pears in Italy is discussed. An account is given of the performances of a number of pears grafted on these stocks, as well as a full account, botanical, horticultural and historical, of the stocks themselves. The species dealt with are *Pyrus Calleryana*, *P. ussuriensis*, *P. betulaefolia*, *P. serotina*.

1160. KEMMER, E., AND SCHULZ, F. 634.1/2-1.541.11  
Die Bedeutung des Sämlings als Unterlage. (**The importance of the seedling as a rootstock.**)\*  
Reprinted from *Landw. Jb.*, 1939, 89 : 114-39.

Investigations started in Berlin in 1930 have been continued. The present report includes more results obtained from tests of apple and pear seedlings and deals also [for the first time.—ED.] with stone fruits. Tables provide full particulars of the varieties tested. Among conclusions now reached are the following:—1. A common assumption that the propagating material of certain varieties is uniform was found to be without foundation. 2. Among pome fruits there are certain varieties that are not suitable for seedling production. 3. Among suitable varieties some produced particularly fine seedlings, irrespective of where the seed had come from or when it had been sown. 4. Several apple and pear varieties are named, with the seed and one-year-old seedlings of which good results were obtained in the trials. 5. Examination of the stone fruit seedlings showed that here, also, grouping the plant material according to types or varieties would prove useful.

1161. JOHNSTON, S. 634.25-1.541.11  
***Prunus mexicana* and *Prunus hortulana* as rootstocks for peaches.**  
*Quart. Bull. Mich. agric. Exp. Stat.*, 1938, 21 : 17-18.

Trials at the South Haven Experiment Station indicate the unsuitability of *P. mexicana* and *P. hortulana* as stocks for peaches. J. H. Hale peaches were dwarfed and shortlived on

\* See also *Ibidem*, 1934, 79 : 793-824 and 1936, 83 : 297-319. (*H.A.*, 1937, 7 : 555).

*P. mexicana*. South Haven and Elberta scions budded on *P. hortulana* in 1934 have not done so well as those on peach roots. No evidence is yet available from this latter trial to show whether peaches on *P. hortulana* are more resistant than others to virus disease.

1162. TOENJES, W. 634.23-1.541.11

**Mahaleb vs. morello rootstocks for early Richmond cherries.**

*Quart. Bull. Mich. agric. Exp. Stat.*, 1938, 21 : 130-1.

Observations are recorded on Early Richmond cherries planted in 1931 at the Graham Horticultural Experiment Station, part on mahaleb, part on morello roots. Trees on morello showed a tendency to earlier and somewhat heavier bearing than those on mahaleb, but this advantage is more than offset by the greater fruit-bearing surface of the latter and their larger total yields.

*Root growth.*

1163. KELLEY, A. P. 582.8 : 581.144.2

**The occurrence of mycorrhizae considered systematically, with special reference to the extent of our knowledge concerning them.**

Landenberg Laboratory, Landenberg, Pennsylvania, 1938, pp. 12.

A synopsis of the results of the author's previous investigations on mycorrhiza.

*Pollination.*

1164. HALL, E. R. 634.23 : 581.162.3

**The pollination of the sweet cherry on Vancouver Island, British Columbia.**

*Sci. Agric.*, 1939, 19 : 525-30, bibl. 5.

Investigations at Saanichton, B.C., with 26 varieties of sweet cherry confirmed the reports of other workers that sweet cherry varieties are completely self-sterile. Among the varieties used, Bing, Lambert and Royal Ann were found to be inter-incompatible. Otherwise sufficient overlapping in blooming periods existed to ensure a supply of viable pollen at the time required. Deacon was found to be a particularly good pollinator. Sour cherries pollinated sweet cherries.

1165. GRAINGER, J. 634.1/7 : 581.144/5 : 632.111

**The internal temperatures of fruit tree buds. II.**

*Ann. appl. Biol.*, 1939, 26 : 1-13, bibl. 3.

Previous investigations were reported *Ibidem*, 23 : 1-10 ; *H.A.*, 6 : 270. In the present experiments at Huddersfield humidity and solar radiation as well as bud and air temperature have been recorded electrically. It is found that, particularly when the buds are bursting, temperatures of apple buds show slight increases as compared with air temperatures during the early stages of a frost. These increases are, however, of very little practical importance. During severe frosts temperatures of apple buds are much the same as those of the surrounding air. Most experiments show that the beneficial effects of orchard heaters burning crude oil are due to warming of the air by convection and not to heating of the bud by direct radiation. It is suggested that a heater which would provide moist, heavy smoke would be a more efficient control of frosts than a flaring heater. Losses by radiation would be minimized, for smoke would provide insulation for the frost itself. A blanket of smoke would diminish the loss of heat by radiation. [It also rouses the anger of neighbouring villages and towns to such an extent as to make the use of this method difficult.—ED.] Such heaters should be so disposed that any katabatic winds would direct the hot air towards the trees. Dormant buds of raspberry have internal temperatures similar to those of apple buds. They are warmed more than the air by solar radiation and are usually cooler than the air at night. Flower buds, flowers and developing raspberry fruits are warmed above air temperature in sunlight (e.g. to 108° F. with air at 81° F.). This may explain the quick ripening of the raspberry.

An examination of hazel bud temperatures suggests that sap cannot freeze more easily when the buds begin to open. There is actually at this time a greater depression of freezing point.



1166. HEILBORN, O. 634.11 : 581.162.3  
**Pollen tube growth in apple styles after inter-varietal cross-pollination.**  
 [Swedish summary.]  
*Lanibrukshögskolans Annaler* (Ann. agric. Coll. Sweden), 1937, **7** : 171-83,  
 bibl. 5.

The pollen tube growth in the styles of apple flowers in combinations of inter-varietal cross-pollinations has been examined. The combinations may be divided into 3 groups : (1) those showing a rear group of abnormally swollen tube ends which completely stop just below the stigma (faintly fertile but not sterile) ; (2) those that lack this rear group and show very little lagging and swelling of the pollen tubes (moderately fertile) ; (3) those showing very rapid pollen-tube growth (very fertile). The work may be carried out in the winter in the laboratory and appears to offer some advantages to the pomologist.\*

1167. SOUTHWICK, L. 634.11 : 581.14  
**Relation of seeds to pre-harvest McIntosh drop.**  
*Proc. Amer. Soc. hort. Sci. for 1938, 1939*, **36** : 410-12, bibl. 15, being *Contr. Mass. Exp. Stat.* **332**.

A moderate but statistically significant correlation between seed number and the time of pre-harvest drop in McIntosh apples has been established.

*Growth and nutrition.*

1168. VERNER, L. 577.15.04 : 634.11 : 581.14  
**The effect of a plant growth substance on crotch angles in young apple trees.**  
*Proc. Amer. Soc. hort. Sci. for 1938, 1939*, **36** : 415-22, bibl. 5, being *Res. Pap. Idaho Exp. Stat.* **179**.

Narrow crotch angles in the framework of fruit trees are structurally weak. It is shown that wide crotch angles result from the action of a hormone formed in the growing points of the young tree and passed downward through the phloem to the developing shoots below, where its action inclines the direction of the growth of the shoot towards a horizontal position. It was found possible to increase the size of the angle of a young shoot by applying indolebutyric acid in lanolin to the upper surface of its basal internode. It was necessary for success that the basal portion of the shoot should be still in growth, as after growth ceases the basal angle remains fixed. Certain difficulties arose, the chief being the fact that the interval of time at which it was possible to apply the paste was very limited (too early caused injury, too late was ineffective). It was then discovered that the slow diffusion of a continuous supply of indolebutyric acid into the cut end of a young whip would cause the development of wide crotch angles throughout the entire tree. The technique of application is simple, a small quantity of indolebutyric acid-lanolin preparation is injected into a 2-inch length of rubber tubing, into one end of which the cut end of the whip is tied. The treatment lasts about 5 weeks.

1169. MACARTHUR, M., AND WETMORE, R. H. 634.11 : 581.47  
**Developmental studies in the apple fruit in the varieties McIntosh Red and Wagener. I. Vascular anatomy.**  
*J. Pomol.*, 1939, **17** : 218-32, bibl. 16.

The anatomy of the apples McIntosh Red and Wagener from the Experimental Farm, Kentville, Nova Scotia, is compared and described. From the evidence presented the authors conclude that the fleshy part of the fruit external to the core line is essentially a calyx tube or, more descriptively, a fleshy floral cup.

\* A paper, also in English, by the same author entitled "Pollen tube growth in self pollinated flowers of diploid apple varieties appeared *Ibidem*, 1938, **5** : 165-77, bibl. 7.

1170. MARANI, M., AND GERBALDI, C. 634.25 : 581.145.1  
Osservazioni su alcuni fattori influenzanti la cascola prefiorale nel pesco.  
(Notes on certain factors affecting flower bud drop in peaches.) [English,  
French and German summaries.]  
*Rev. Frutticoltura*, 1939, 3 : 119-29.

Bud drop of peaches, particularly of the variety Bonvicini, was studied in Italy (Ravenna). Intensity of drop was greater on the lower parts on the tree and on those parts exposed to the north than on the higher parts and on those exposed to the south. From this and other data examined it is concluded that lack of sunlight during the vegetative period predisposes to bud drop and those parts which have been unduly shaded during growth are the first to suffer. Examination showed that the shoots of such shaded parts (low N.W.) have a higher water content. From a practical standpoint it would appear that bud drop might possibly be reduced by efficient pruning which would expose all parts of the tree to adequate light.

1171. VON VEH, R. 581.3 : 634.11 + 634.25  
Über Entwicklungsbereitschaft und Wüchsigkeit der Embryonen von Apfel,  
Pfirsich u.a. (The readiness to grow and actual growth of the embryos of apple,  
peach, etc.)  
*Züchter*, 1939, 11 : 249-55, bibl. 14.

Experiments at the Pillnitz State Botanical Laboratory with apple seed kept in water showed that seed dormancy has no direct effect on the embryo, but affects the endosperm which controls the progress of embryo development. The exact nature of this influence has as yet not been established. Experiments with peaches proved that entire absence of seed dormancy had no effect on the growth and readiness to flower of seedlings, whether they were used as stocks or scions.

1172. TUKEY, H. B., AND YOUNG, J. O. 634.23 : 581.145.2  
Histological study of the developing fruit of the sour cherry.  
*Bot. Gaz.*, 1939, 100 : 723-47, bibl. 24, being *J. Article N.Y. St. agric. Exp.*  
*Stat.* 298.

The gross development of the Montmorency sour cherry from 18 days before full bloom to fruit ripening is discussed and illustrated, as also the histological changes during the pre-bloom stage and stages I, II and III, which denote respectively rapid development for 20 days following full bloom, retarded development for 16 days, and rapid development for 21 days to fruit ripening.

*Cultural practice, soils, etc.*

1173. PAGE, F. 631.546 : 634.1/2  
L'arcure des branches fruitières. (Bending the branches of fruit trees.)  
*Rev. hort. Suisse*, 1939, 12 : 9-14.

The method described and illustrated with 16 drawings is one of some antiquity. It consists in bending and fixing in an arc the current year shoots of shy bearing apples or pears with the object of inducing the formation of fruit spurs along the arc. The best time is in May or June, but any time when the twigs to be bent are sufficiently pliable will do. The pruning of trees so treated is described and illustrated.

1174. KEMMER, E. 634.1/2-1.542  
Die Verbesserung des Schnittes der Hochstämme. (Improvements in pruning  
standard fruit trees.)  
Reprinted from *Proceedings of the XIIth International Horticultural Congress*,\*  
Section V, 7, pp. 93-100.

In modern pruning methods particular stress is laid on the good formation of the main leaders. This is aided (1) by checking all growth but that of a few strong leaders and encouraging the growth of laterals, (2) by not allowing laterals to become more powerful than the leader, or young top branches to grow more rapidly than the older branches.

\* These proceedings are not yet available in this country, Nov. 1939.—ED.



1175. ALDRICH, W. W., AND GRIM, J. H. 634.13-1.542

**Further investigation on the relations of pruning to set of fruit in pears.**

*Proc. Amer. Soc. hort. Sci. for 1938, 1939, 36* : 328-34, bibl. 4.

No definite evidence was obtained that increased water supply to the blossoms following pruning caused increased set of fruit of Anjou pears in investigations carried out by the Medford Experiment Station, Oregon. Possibly increased set following pruning may be due to effects of increased respiration near the cuts or to the activation of enzymes or growth-promoting substances.

1176. ANAGNOSTOPOULOS, P. T. 634.37-1.542

**The effect of summer pruning on the fruiting of figs.** [Greek, English summary 19 lines.]

*Hort. Res., Athens, 1939, 4* : 195-207.

The author tested summer pruning the fig in Thessalonica in 1938. The pruning, which was done in May, consisted in cutting back the ends of the new shoots after the formation of 2, 3, 4 and 5 leaves. Pruning to 2 and 3 leaves resulted in (1) formation of 2 new shoots more vigorous than the control, (2) more fruit, (3) late maturity of fruit. Pruning to 4 leaves resulted in (1) formation of 1 new shoot, (2) to less strong growth but greatly increased fruiting, (3) to fruit ripening at same time as control. Pruning to 5 leaves resulted in (1) formation of 1 new shoot more vigorous than in previous cases, (2) generally better fruiting and (3) earlier fruit ripening. The experiments will be continued.

1177. DOTTI, F. 631.541 : 634.11-2.19

Innesto di rinverimento di meli adulti che difettano nelle radici.

**(Rejuvenation by inarching of apple trees suffering from poor root systems.)**

*Riv. Frutticoltura, 1939, 3* : 177-98, bibl. 19.

An illustrated account of successful experiments with apple trees mainly on No. II rootstock, which were brought into vigour again by planting seedling stocks beside them and grafting the seedling into the scion variety well above soil level. A good deal of the article describes results achieved by Thomas, Ward, Cardwell and Bradford, and workers at East Malling, but the author's own results are also interesting as showing the excellent effect on growth of inarching, especially in cases where the scion has not formed its own roots. Among notes from his experience the following may be noted. The take appears better if the seedling is grafted the year of its planting and not a year afterwards. The best results are got by planting and inarching 2 seedlings, one on each side of the sickly tree. It is further suggested that the system might well prove useful in some cases of diseased vines, especially as regards phylloxera, and it is noted that experiments are in progress on the point.

1178. BOBB, A. C., AND BLAKE, M. A. 634.11-1.55-1.542.27

**Annual bearing in the Wealthy apple was induced by blossom thinning.**

*Proc. Amer. Soc. hort. Sci. for 1938, 1939, 36* : 321-7, bibl. 5.

Blossom thinning of a 19-year-old Wealthy apple tree at the Agricultural Experiment Station, New Brunswick, N.J., induced a habit of annual bearing. Factors leading to success are thought to be the growth status of the tree, the removal of terminal flower buds, the removal of Class III and IV flower clusters (i.e. containing buds of the smallest sizes), the proper number and distribution of the Class I and II clusters (i.e. dormant buds exceeding .19 inches in diameter) allowed to fruit, and some later thinning of fruits.

1179. MURNEEK, A. E. 634.11-1.542.24

**Further results on the influence of branch ringing on fruit set and size.**

*Proc. Amer. Soc. hort. Sci. for 1938, 1939, 36* : 398-400, bibl. 3, being *Contr.*

*Dep. Hort. Mo. Exp. Stat. J. Ser. 600.*

Branch ringing carried out at the proper time is shown to increase the set and size of apples in Missouri.

1180. UPSHALL, W. H. 634.1/2-1.543  
**Investigations on transplanting fruit trees.**  
*Sci. Agric.*, 1939, 19 : 510-23, bibl. 8.

The investigations are reported from the Vineland Experiment Station, Ontario, and have been in progress for 5 years. Some of the results are :—Early planting in spring gave similar results to autumn planting. Delayed planting or delayed digging from the nursery row resulted in loss in stand and growth. Autumn-planted trees often produced new roots at once which would start growth again in spring before the soil was fit for planting. The order of decreasing development of new roots in autumn was plum, apple, pear, cherry, peach. Autumn-planted trees had recovered their loss in weight on transplanting by mid-May. Desiccation, particularly through leaf transpiration, was harmful. Moderate top pruning of sweet cherry trees at planting resulted in a slight increase in size over unpruned trees. Severe top pruning had reduced the amount of new root growth when estimated at the end of May. Disbudding did not reduce root growth and appeared to be slightly beneficial. Trimming the roots of heeled-in trees at planting time decreased the growth of the trees.

1181. DE HAAS, P. G. 634.1/2-1.8  
 Über die Wirkung von Stickstoff, Kali und Phosphorsäure auf Wachstum, Ertrag und Erntegüte bei Kern- und Steinobst. (The effect of N, K and P fertilizers on growth, yield and quality of pome and stone fruits.)  
*Forschungsdienst*, 1939, 7 : 607-19, bibl. 64.

The results of the study in Jork of the effect of N, K, and P on fruit trees may be summed up as follows :—An increase in yield was mainly brought about by nitrogen applications while simultaneous applications of K and P secured good quality in the fruit. Since a one-sided increase of the yields would unfavourably affect the state of health of the trees, a well-balanced application of the three principal nutrients was found to be absolutely necessary. Nitrogen and potassium deficiencies, especially the former, cause the more serious injury. Whereas, however, damage due to nitrogen deficiencies can easily be put right, that due to potash deficiency is not so easily remedied. Phosphorus deficiency only becomes apparent in its advanced stage.

1182. SHAULIS, N. J., AND MERKLE, F. G. 631.51 : 634.1/7-1.874  
**Some effects on the soil of different soil management practices.**  
*Bull. Pa agric. Exp. Stat.* 373, 1939, pp. 26, bibl. 42.

In Pennsylvania sod management of orchards resulted in a greater fertility of the soil than either clean cultivation or use of annual cover crops. The use of sod increased the total nitrogen content over that of forest soil. The total nitrogen, organic carbon and volume weight of the soil were lower under non-leguminous cover crop management than under forest conditions. A leguminous cover crop, as used at the State College, maintained orchard soil in a satisfactory condition. Clean cultivation caused depletion of the orchard and vineyard soils.

1183. REYNEKE, J., AND REINECKE, V. 634.11-1.556.1  
**Picking maturity of apples.**  
*Fmg S. Afr.*, 1939, 14 : 185-95.

The paper is a progress report of investigations to determine the correct time of picking White Winter Pearmain and Ohenimuri apples in the Langkloof area, S. Africa. The rate of ripening on the tree was affected by environmental conditions, such as soil moisture, nitrogen, etc., and was reflected in the rate of ripening in storage. The solids/acid ratio is a suitable supplementary method to the iodine test because it more effectively reflects small changes in maturity and is vitiated by factors other than maturity to a lesser degree than the individual constituents. Too early picking results in bitter pit, scald and shrivelling in storage, while too late picking causes severe wastage through internal breakdown. Inside apples are less mature than outside apples on any given date. Fruit developed more rapidly under delayed storage conditions than on the tree. Fruits held at ordinary temperature for 14 days before cold storing are less susceptible to scald and bitter pit than fruits cold stored immediately after picking. If the held fruit is advanced in maturity it becomes increasingly susceptible to internal breakdown during storage.



1184. BLACKMON, G. H. 634.25  
**Transplanting peach trees.**  
*Pr. Bull. Fla agric. Exp. Stat.* 526, 1939, pp. 2.  
 Practical hints for the Florida peach grower.  
 BLACKMON, G. H. 634.25-1.536  
**Peach varieties for Florida.**  
*Pr. Bull. Fla agric. Exp. Stat.* 527, 1939, pp. 2.  
 Notes on varieties recommended for Florida.  
 HRUBEC, K. 634.23 : 576.312  
**The cytology of the Duke cherries and their derivatives.**  
*J. Genet.*, 1939, 38 : 125-31, bibl. 10.

## SMALL FRUITS, VINES, NUTS.

185. ENGARD, C. J. 634.711 : 581.192  
**Translocation of carbohydrates in the Cuthbert raspberry.**  
*Bot. Gaz.*, 1939, 100 : 439-64, bibl. 32, being *Contr. bot. Dep. St. Coll. Washington*, 57.  
 The seasonal fluctuations in reducing sugars, sucrose, starch, acid, hydrolysable carbohydrates, total carbohydrates and the residual polysaccharides are recorded for the Cuthbert raspberry plant, a hybrid of *Rubus Idaeus* L. and *R. strigosus* Mich.  
 1186. ENGARD, C. J. 634.711 : 581.192  
**Translocation of nitrogenous substances in the Cuthbert raspberry.**  
*Bot. Gaz.*, 1939, 101 : 1-34, bibl. 22, being *Contr. bot. Dep. St. Coll. Washington*, 58.

The study is concerned with the translocation of nitrogenous substances in the vegetative canes of the Cuthbert raspberry, a hybrid derived from *Rubus Idaeus* L. and *R. strigosus* Mich., in U.S.A. The bulk of mineral nitrogen absorbed by the roots is carried in the transpiration stream. Elaboration of the nitrates to amino acids and protein occurs in all parts of the plant where the proper conditions for nitrate reduction exist. There is no definite longitudinal translocation of organic nitrogen in the bark, but the possibility of local movements of organic nitrogenous substances from regions of higher to lower concentrations is not excluded.

1187. LEWIS, D. 634.711 : 575.116  
**Genetical studies in cultivated raspberries. I. Inheritance and linkage.**  
*J. Genet.*, 1939, 38 : 367-79, bibl. 15.  
 1188. JOHNSTON, S. 577.15.04 : 634.73  
**The influence of certain hormone-like substances on the rooting of hardwood blueberry cuttings.**  
*Quart. Bull. Mich. agric. Exp. Stat.*, 1939, 21 : 255-8.

Trials in 1937 and 1938 showed that the substances used, namely Hormodin A and Auxilin, were of little value for stimulating root formation in hardwood cuttings of blueberries.

1189. KEMMER, E., AND HEROLD, G. 634.75  
**Zur Sortenfrage bei Erdbeeren. (Strawberry varieties.)**  
*Forschungsdienst*, 1939, 4 : 353-60, bibl. 8.

The more important results of varietal tests of strawberries in Berlin-Dahlem may be summed up as follows:—1. It was difficult to obtain varietally pure plant material. 2. The varieties Königin Luise and Madame Moutot had several names in the trade. 3. There was no relationship between yield and production of runners, although certain varieties producing many runners were poor yielders. 4. The number of inflorescences per plant could not be correlated with yield.

5. Certain varieties produced female flowers only and required a pollinator variety. 6. Yields for three years showed wide fluctuations within the varieties. Eva Macherauch gave the best mean crop for three years. The average yield of all varieties in the first year was one-fifth and in the second year three-quarters of the third year's crop.

1190. BARNES, H. 634.75  
**Strawberry culture in Queensland.**  
*Qd agric. J.*, 1939, 51 : 291-5.

An account is given of the methods of strawberry cultivation in Queensland. The varieties now planted are Phenomenal and Aurie, both seedlings of local origin. No varieties in Queensland prove permanent, deterioration always occurring in a few years. It is necessary, therefore, to produce new seedling varieties and this is successfully accomplished, some of the best varieties ever grown in the State being locally raised seedlings. The demand is for a heavy bearer of highly coloured fruit of firm texture and fine flavour, which will meet the requirements of the fresh fruit trade and of the jam manufacturer.

1191. CAROLUS, R. L., AND LORENZ, O. A. 631.8 : 635.61  
**The interrelation of manure, lime and potash.**  
*Proc. Amer. Soc. hort. Sci. for 1938*, 1939, 36 : 518-22, bibl. 3, being *Pap. Dep. Veg. Crops Cornell Univ.* 183.

On light sandy soil at Cornell Experiment Station, Ithaca, N.Y., the addition of lime promoted early maturity and increased yield of musk melons. A reduction in soluble potash content found in plants from the limed plots may have been due to the increase of growth that occurred or to some depressing effect of added calcium or potassium absorption by the plant. Farm manure applied up to 30 tons per acre favoured early maturity and increased yields. Higher quantities reduced total yields of marketable fruit. On heavily limed, sandy soils this is probably due in part to the potash content of manure which remains in readily available form.

1192. DE LATTIN, G. 634.8  
**Über den Ursprung und die Verbreitung der Reben. (The origin and distribution of vines.)**  
*Züchter*, 1939, 11 : 217-25, bibl. 22.

According to their distribution the different races of the subgenera *Muscadinia* Planch. and *Euvitis* Planch. are classified into (1) North American, (2) Pacific coast and (3) West-European-Asiatic vines.

1193. VAILE, J. E. 634.8  
**Grape varieties in Arkansas.**  
*Bull. Ark. agric. Exp. Stat.* 379, 1939, pp. 24, bibl. 15.

Of the 72 grape varieties tested producing moderate to high yields, 32 were found unsuitable for planting in Arkansas on account of poor dessert quality, susceptibility to black rot, uneven ripening, poor shipping and keeping quality or lack of vigour. The remaining 40 include varieties that are suitable for planting in all regions of the State and varieties that are only suitable for planting in certain areas.

1194. DICKEY, R. D., AND LOUCKS, K. W. 634.8  
**Grape growing in Florida.**  
*Bull. Fla agric. Exp. Stat.* 324, 1938, pp. 36, bibl. 11.

Of the so-called American bunch type, only few varieties are grown commercially in Florida, the principal varieties being Florida Beacon, Carman and Niagara. None of the *Vinifera* varieties are satisfactory. The more important rootstocks are Florida Beacon, R. W. Munson, and *Vitis Champini*. The practice is to set the vines spaced at 8 feet in rows 10 feet apart, vigorous 1-year-old planting stock being the most desirable. Propagation is done by hardwood cuttings, grafting and layering. The vines are pruned in the usual manner and trained on the



Munson three-wire canopy trellis. Cultivation is shallow. Green crop and farmyard manures are used. Under favourable conditions fruit may be stored for about two months. Muscadine vines grown in Florida belong all to the species *Vitis rotundifolia*. The principal varieties are Scuppernong, James, Thomas and Flowers. The muscadine vines are propagated almost entirely by layering. The best time for planting is in December. Pruning depends on the manner in which the vines are trained. Failure of muscadine vines to set fruit is said often to be due to the absence of male plants in the vineyards. The more important insects and diseases attacking grapes in Florida and control measures against them are discussed.

1195. JARDINE, F. L. 634.8

**The culture of the grape vine in Queensland.**

*Qd agric. J.*, 1939, 51 : 136-72.

This article presents a very full account of the methods of grape growing in Queensland. Particular attention is paid to propagation and methods of pruning and training. The descriptions are well illustrated by clear drawings.

1196. HUGO, F. C. 634.87

**Sultana farming along the Orange River.**

*Bull. Dep. Agric. S. Afr.* 184 (Plant Industry Series 34), 1938, pp. 20.

The object of this bulletin is "not to prove the truth of certain hypotheses or to dogmatize on certain points of view, but merely to serve as a treatise on what has been proved by practice to be the best way of applying the principles of cultivation, irrigation, and fertilization of vineyards, and of making raisins under local conditions", i.e. at Kakamas along the Orange River, Union of S. Africa.

1197. MARNEFFE, —. 634.872

**Die Tafeltraubenkultur in Belgien. (Cultivation of table grapes in Belgium.)**

*Ernähr. Pfl.*, 1939, 35 : 108-11.

In Belgium table grapes are produced on a large scale in glasshouses. Owing to very warm temperatures in the glasshouse [not stated.—Ed.] ripe grapes are available throughout the year, early-ripening varieties bearing fruit 4 months after planting and late varieties 6 to 12 months after. A single glasshouse, covering an area of approximately 180 square yards, produces 300-500 kg. yearly. Every glasshouse is given in addition to an ample supply of well-rotted manure, 20 kg. sulphate of ammonia, 10 kg. dicalcium-phosphate and 20 kg. sulphate of potash. During the growth period nitrogen is applied as required in the form of sodium nitrate. Both cuttings and layers are used as planting material. Grafted vines are also frequently used. Cuttings are spaced at 25-30 cm. During the summer young vines are given liquid manure and some cow manure to prevent them from drying up. The following year the vines are transplanted to their permanent quarters in rows at 1.5 to 2 m. from one another outside the glasshouse. During the winter the above-ground portions of the vines are trained in a special manner to grow inside the glasshouse. Need is stressed for attention to the cultural and manurial treatment of the whole feeding area, pruning, thinning and the maintenance of correct humidity of soil and air, temperature conditions and aeration. In the early stages melons or cucumbers are grown in the same house.

1198. VAN NIEKERK, S. W. 634.8-1.541.11

**Rootstock investigations in connexion with vines.**

*Fmg S. Afr.*, 1939, 14 : 222, 229.

The idiosyncracies in South Africa of certain rootstocks for vines are discussed and a brief note is given of the methods employed in testing the various stocks both old and new on every possible soil type.

1199. GERVAIS, P. 634.8-1.541.11  
 La question des porte-greffes. (**Vine rootstocks.**)  
*C.R. Acad. Agric. Fr.*, 1939, 25 : 819-34.

The author discusses the all-important influence that soil has on vine rootstocks and on the actual effect which they have on their scions and on their resistance to phylloxera. He notes briefly the more important characteristics of some of the Riparia, Rupestris, Cordifolia and Berlandieri hybrid rootstocks.

1200. LEFÈVRE, J. 577.15.04 : 634.8  
 Quelques résultats observés après traitement de greffes-boutures de vignes par des phytohormones.  
*C.R. Acad. Agric. Fr.*, 1939, 25 : 629-32.

Experiments with grafted cuttings and indolylbutyric and indolylacetic acid indicate that these substances have a definite appreciable effect on the vine, that of indolylacetic acid being the greatest in the required direction. Further they suggest the expediency of further trials in which the base of the grafted cutting is soaked for 48 hours in indolylacetic acid solution at a strength of 1/10,000.

1201. COOPER, J. R., AND VAILE, J. E. 634.84  
**Response of American grapes to various treatments and vineyard practices.**  
*Bull. Ark. agric. Exp. Stat.* 378, 1939, pp. 74, bibl. 37.

Certain aspects in the cultivation of American vines under Arkansas conditions are here considered. They include notes on training, fruiting habits, pruning, thinning, fertilizer treatments, frost injury, rootstocks and uneven ripening.

1202. DOTTI, F. 634.8-1.546  
 La produttività della vite in rapporto alla forma di allevamento del tutore vivo e alla sostituzione del tutore vivo con tutore inerte. (**Productivity in the vine and its relation to the manner in which its living support is trained and to the substitution of inert for living supports.**)  
*Riv. Frutticoltura*, 1939, 3 : 209-21, bibl. 4.

Reference is made to the author's own work and that of Manaresi and others on the relative merits of different living trees as vine supports [see also *H.A.*, 5 : 572 and 8 : 1016]. In this article he gives figures of the comparative production over 6 years of vines trained on living supports with that of vines in alternate rows trained on inert supports such as wood or cement. They are very much in favour of the inert supports as regards quantity, and, although as regards sugar—as given by the Baumé figures—there is little to choose and that little in favour of the living supports, it is thought that as the vines become more mature and in seasons not cursed by obnoxious frosts and above all hail, the grapes grown on the inert supports would show also a greater sugar content as the result of their greater exposure to the sun.

1203. GREGORY, J. H. 634.872-1.564  
**Packing grapes for market.**  
*Qd agric. J.*, 1939, 51 : 280-90.

Full instructions are given for packing grapes chiefly for export, under Queensland conditions.

1204. MANNING, W. E. 586.28 : 581.46  
**The types of stigmas in the Juglandaceae.** (Abstract.)  
*Amer. J. Bot.*, 1938, 25 : 555.  
 HEIMSCH, C., AND WETMORE, R. H. 586.28 : 581.44  
**The significance of wood anatomy in the taxonomy of the Juglandaceae.**  
*Amer. J. Bot.*, 1939, 26 : 651-60, bibl. 20.

A study of the xylem anatomy by Heimsch and Wetmore confirms the findings of Manning in his investigations into the floral morphology of *Juglandaceae* and described *Ibidem*, 1938, 25 : 407-19, noted *H.A.*, 9 : 453, for the purpose of determining generic relationships within the family.

1205. LUTZ, H. 634.521

**The effect of size of young pecan trees on their subsequent growth and yield.**

*Proc. Amer. Soc. hort. Sci. for 1938, 1939, 36 : 335-8, bibl. 1.*

The relationship between initial size (at the beginning of an experiment) and yield of young pecan trees is shown to be much closer than between initial size and growth. The relationship is so close as to make possible the planning of an experiment of this type even where trees of uniform size cannot be obtained.

# PLANT PROTECTION OF DECIDUOUS FRUITS.

1206. SETTERSTROM, C., AND ZIMMERMAN, P. W. 632.184

**Factors influencing susceptibility of plants to sulphur dioxide injury. I.**

*Contr. Boyce Thompson Inst., 1939, 10 : 155-81, bibl. 30.*

The paper attempts to provide some basis for evaluating the considerable accumulated data on the effects of sulphur dioxide on vegetation, and to afford a broader view of the mechanism of sulphur dioxide injury. Resistance of plants to sulphur dioxide was found to increase at temperatures below 40° F., when approaching wilting point and when young. A decrease in resistance is found with marked increase in relative humidity, when grown with an ample supply of water, when grown in a poor soil, when grown under heavy shade and in middle-aged rather than in old or young leaves. Susceptibility is not influenced either way by minor variations in adequate soil moisture at time of exposure to sulphur dioxide, by sulphate content of nutrient supply, by pre-treatment with sulphur dioxide—provided time is allowed for recovery between treatments—by reduction of light intensity up to 25% or by wetting of leaf surfaces. It is hoped that eventually susceptibility to sulphur dioxide may be used as an indicator of certain physiological processes.

1207. SIMINOVITCH, D., AND SCARTH, G. W. 632.111

**A study of the mechanism of frost injury to plants.**

*Canad. J. Res., 1938, 16, Sec. C, pp. 467-81, bibl. 21.*

Two types of freezing living plant tissue are found, intracellular and extracellular freezing. Intracellular freezing is probably the sole source of injury to herbaceous plants in early frosts, because when hardened they can survive extracellular freezing at temperatures then obtaining. In intracellular freezing the ice forms first in the protoplasm and then in the vacuole and kills by visible mechanical disruption of the vacuole. It is apparently resisted in hardy plants by a greater permeability of the protoplasm to water. In extracellular freezing ice forms outside the cells from water in the cells, the dehydration causing the cells to collapse. Extracellular freezing may perhaps be resisted by the lower viscosity of the protoplasm, but cells of unhardened plants may be killed, even though the injury is not apparent during thawing.

1208. LAFFOND, P., AND SELTZER, P. 632.111

Experiences de lutte contre les gelées blanches faites en Algérie en février et mars 1939. (**Frost control trials in Algeria in the spring of 1939.**)

*C.R. Acad. Agric. Fr., 1939, 25 : 634-42.*

Spring frost trials at Oued Fodda and the Maison-Blanche showed that it was possible by means of oil burners at the rate of 65-80 an acre to raise the temperature enough to control frosts in the nature of 7° F. to 10° F. of frost. The cost, however, appears at present to make such a practice uneconomic, except for particularly valuable crops in districts peculiarly susceptible to such frosts.

1209. MERCANTON, M. P. L. 632.111

Sur un procédé de lutte contre le gel. (**A method of preventing frost damage.**)

*C.R. Acad. Agric. Fr., 1939, 25 : 424-6.*

The ingenious procedure of a Brigue professor, Dr. J. Gattlen, is described. On six nights of frost in spring and one in autumn he arranged for water to fall at a temperature of about +4° C.

\* See also 1336.



in a fine spray on to his dahlias and certain vegetables. The water froze immediately and covered the plants with a thick sheet of ice. Watering was continued without pause until on the following day the temperature rose above  $0^{\circ}$ . The air temperature then combined with the watering, which was continued, gradually caused all the ice to dissolve disclosing completely undamaged plants. The explanation given is as follows:—When the outside temperature is low enough for the sprayed water to freeze, the release of its fusion heat results in determining a temperature of  $0^{\circ}$  as the lowest limit in the sheet of ice which surrounds the plant. Thus one kg. of water at  $+5^{\circ}$  will render available, after freezing,  $5+80$  great calories, almost entirely all to the benefit of the plant. The essential points are (1) the continuance of the spray until the air temperature rises above zero, (2) a sufficient supply of water to allow of this, (3) the endurance of a temperature of  $0^{\circ}$  by the plants concerned.

1210. SCHLENZ, P.

632.111 : 634.1/8

Bekämpfung von Spätfrösten im Obstbau. (Late frost control in the orchard.)  
*Obst- u. Gemüseb.*, 1939, 85 : 38-9.

North German experience indicates that *orchard heaters* are useful when the temperature does not fall below  $-2^{\circ}$  C., since they can only raise temperature in the orchard by 1 to  $1.5$  degrees. It is quite futile to use the heaters on hilly ground or when the air movement is strong, but they may be used effectively for making smoke screens to protect the flowers from the action of the sun early in the morning. *Protection by chemical mists* is effective under much the same conditions as are orchard heaters. It is, however, only a commercial proposition when carried out over a large area. The acid fumes do no harm to trees, but must be handled carefully. *Air heating*. Open briquet fires are too dear and hence this method should only be used for bush fruit protection, but briquet stoves are reasonably inexpensive to run. Some plants can under certain conditions be protected from frosts by *spraying with water*. Night frosts may be effectively combated by thorough spraying with milk of lime, soft soap solutions and a spreader. Dusting of the inflorescences with powdered lime also gives a fair measure of frost protection. Frost injury on vines may be prevented by delaying their development by means of a coating of various oils, among which a 7% paraffin oil emulsion gave the best results. Another method of combating frost is the improvement of the micro-climate. Certain suggestions in this respect are made.

1211. MÜLLER, G.

634.22-2.111

Untersuchungen über die Kältefestigkeit von Pflaumensorten. (Frost  
 hardiness of plums.)

Reprinted from *Z. Pflanzenz.*, 1939, 23 : 91-144, bibl. 11.

1. The object of the present study was to determine by means of artificial freezing the relative frost tolerance of plum varieties. 2. For this purpose in the two experimental years of 1936-7 and 1937-8, 11,500 one-year-old shoots were examined of 73 plum varieties belonging to 79 strains found in different parts of Germany. 3. Low temperatures were obtained by the use of cold chambers at the Halle Institute of Plant Industry and of Schwechten's freezing apparatus in which the cooling is by dry ice. 4. Microscopical examinations were made of 400 cross sections of the frozen shoots in order to determine the amount of injury. 5. It was found that the greatest amount of injury occurred at the apical end of the shoot, decreasing towards the basal end, and that the buds and the area around them were particularly susceptible to frost injury. 6. A special system was worked out which permitted recording of the various degrees of hardiness of the shoots examined. 7. It was shown that the amount of injury depended on temperature, duration of freezing and on the freezing method. Provided the temperatures and the length of freezing treatments were the same, the injuries on shoots were more severe when the dry ice method was employed than when the shoots were frozen in cold chambers. 8. Enquiries made of the effect of local climatic conditions on hardiness of plum varieties tested showed that frost tolerance depended above all on the maturity of the wood. 9. Of the enquiry forms sent to

various peasant associations 464 were returned with particulars filled, and were then used for estimating the hardness of plum varieties in practice. 10. Practical experience did not agree in some points with the results obtained in artificial freezing experiments. 11 and 12. No definite conclusions could be reached as to what extent spring frosts affect the different varieties of plums. [From author's summary.]

1212. JOHNSTON, S. 634.73-2.111

**The frost control problem with special reference to blueberries.**

*Quart. Bull. Mich. agric. Exp. Stat.*, 1939, 22 : 3-10

**The resistance of certain high bush blueberry varieties to injury by frost.**

*Ibidem*, pp. 10-11.

Experiments by the U.S. Weather Bureau and in England indicate that the temperature in an orchard is appreciably lowered by the presence of a cover crop up to a height of five feet or more. This suggests that in blueberry fields ploughing in the spring before blossoming might make all the difference in the important zone of 1-3 ft. above ground level. Further investigations by the Weather Bureau show that temperature falls several degrees lower at night over wet than over dry ground. Hence if ground is too wet in the spring it should be drained by ditches, which, if thought desirable, can be dammed to prevent the loss of water which may be wanted later. Selection of hardy varieties should be practised. In the second article trials on the frost resistance of seven improved varieties at South Haven are recorded. It was found that Rubel, Rancocas, Adams and Jersey were reasonably hardy.

1213. HARLEY, C. P. 634.11-2.19

**Some associated factors in the development of watercore.**

*Proc. Amer. Soc. hort. Sci. for 1938*, 1939, 36 : 435-9, bibl. 6.

The effects of leaf area, nitrogen and soil moisture on the development of watercore in Delicious apples was studied at Wenatchee, Washington. No fruits develop watercore after removal from the tree and therefore the predisposing factor is the photosynthetic activity of the leaf. Nitrate of soda accelerated the development of watercore only when a sufficient leaf area was present to provide the required carbohydrates, but the acceleration may be quite important, i.e. nitrogen +30 leaves per apple showed watercore equal to that shown by no nitrogen +70 leaves per apple, and some degree of watercore increase was shown in all but the plots having 10 leaves per apple. It is pointed out that the trees in the experiment were somewhat deficient in nitrogen and that the results might not be similar on trees already sufficiently supplied or if the nitrate was applied, as it was not in this case, early enough appreciably to influence extension growth or total leaf area. Soil moisture effects were not apparent.

1214. WARD, K. M. 634.11-2.19

**Little leaf—a functional disorder of apple trees at Stanthorpe.**

*Qd agric. J.*, 1939, 51 : 458-73, bibl. 12.

The symptoms of little leaf are complete suppression of terminal growth, followed by dieback on branches or on whole trees. In spring development of foliage on affected branches is delayed, leaf growth is reduced and rosettes of small leaves appear in place of normal foliage and shoot growth. The control of little leaf lies in the application of zinc to affected trees. The investigations at the Stanthorpe Experiment Station, Queensland, with which this paper deals, were designed to find the most practicable means of supplying zinc to apple trees growing under a variety of conditions. Definite response after one growing season was obtained only from those trees which had a dormant spray consisting of 50 lb. zinc sulphate to 100 galls. of water. Treatments which failed to give results the first season were foliage sprays, soil dressings and tree injection. The interaction of zinc sulphate and other spray materials used in combination is discussed.

1215. REED, H. S. 632.19 : 634.2

**How does the little leaf disease affect the meristem of trees ?**

(Papers presented before the Pacific Section of the Botanical Society of America, Stanford University, California.)

Abstract in *Amer. J. Bot.*, 1939, 26 : 671.

Dwarfed shoots and leaves are characteristic of apricot and peach trees affected with the little leaf disease. The cytological aberrations of the meristematic region of affected shoots lead to hyperchromatization, vacuolization, and polarization of the cell contents. Tannic compounds are most abundant in early spring and late autumn. They are conspicuous in partially differentiated cells of the sub-apical region. All mitosis is inhibited in these cells. Phloroglucinol is most abundant in the phloem and medullary rays of affected apricot shoots about 5 mm. long in March when tannic compounds have disappeared. In June shoots of healthy apricot trees contain large amounts of phloroglucinol in the cortex, then in smaller amounts in medullary rays, pith and phloem. In general there is parallelism between the amounts of starch and phloroglucinol in the apricot shoots. [Abstract as given in *Amer. J. Bot.*]

1216. THOMAS, P. H., AND RAPHAEL, T. D. 634.21-2.19

**Notes on apricot dieback. Circumvention by propagative methods.**

*Tasm. J. Agric.*, 1938, 9 : 46-9.

Apricots in Tasmania are often subject to a severe dieback of spurs, branches and not infrequently of the whole tree, which causes serious loss. It was found that when the dieback occurred in apricots on cherry-plum stock the disease appeared to stop at the union, while the plum stock would send out innumerable suckers from the roots. Selected suckers have been reworked with apricot (by the V bark graft). The rejuvenated trees have grown vigorously and have so far shown no sign of the disease, even though the old diseased stump has not been removed. The authors write, "... development along the lines indicated rests on the assumption that any dieback which may arise in the course of time will merely cause the loss of one portion of the tree, a loss easily offset by inserting another apricot scion or bud in the parent plum framework. If such a theory is sound, the smaller and more numerous the apricot units inserted on the plum framework, the more insignificant the loss should dieback commence."

1217. ASKEW, H. O., AND WILLIAMS, W. R. LL. 634.21-2.19 : 546.27

**Brown spotting of apricots, a boron deficiency disease.**

*N.Z. J. Sci. Tech.*, 1939, 21 : 103A-6A, bibl. 2.

Boron deficiency in apricots, indicated by a browning of the flesh, particularly at the stem end, may be controlled by the use of hydrated borax either as a top soil dressing or as a spray.

1218. ROSE, D. H., BRATLEY, C. O., AND PENTZER, W. T.

632.3/4 : 664.85.7 + 664.85.8

**Market diseases of fruits and vegetables : grapes and other small fruits.**

*Misc. Publ. U.S. Dep. Agric.* 340, 1939, pp. 27, bibl. 53.

This is an illustrated description of the economically more important market diseases in the United States of blackberries, currants, dewberries, cranberries, gooseberries, grapes, raspberries, and strawberries. Notes are given on their control.

1219. STOREY, H. H. 632.8 : 632.6/7

**Transmission of plant viruses by insects.**

*Bot. Rev.*, 1939, 5 : 240-72, bibl. 90.

A clear exposition of present knowledge of the insects concerned in the spread of virus diseases and of their mode of operation.



1220. KIENHOLZ, J. R. 634.13-2.8

**Stony pit, a transmissible disease of pears.**

*Phytopathology*, 1939, 29 : 260-7, bibl. 2.

A deformity and pitting of Bosc and Anjou pears in Oregon, California and Washington has been investigated in Bosc pears by the author, who by budding experiments has shown it to be due to a virus. The symptoms are deep pitting and probably a veinlet chlorosis of certain leaves. Bartlett, on budding with diseased material, was found to be either tolerant or immune. Control methods are not suggested.

1221. MORWOOD, R. B. 634.8-2.4

**Grape vine diseases in Queensland.**

*Qd agric. J.*, 1939, 51 : 5-14.

The three principal diseases of grape vines in Queensland are downy mildew (*Plasmopara viticola*), powdery mildew (*Uncinula necator*), anthracnose (*Elsinæ ampelina*). Minor diseases, either parasitic or physiological, are various fungal fruit rots, berry shrivel, dead arm (*Cryptosporella viticola*), coulure or non-setting, red leaf, court-noué or excessive branching, shortening of the internodes and production of pearsley leaves combined with non-setting.

1222. BROWN, H. P. 634.23-2.3

**Gummosis and die-back of cherry trees.**

*Agric. Gaz. N.S.W.*, 1939, 50 : 386-8, bibl. 3.

A gummosis and die-back of young cherry trees in New South Wales has recently caused heavy losses. A study of the disease and laboratory tests indicate that the disease is the bacterial one causing bacteriosis of sweet cherry trees in England the organism of which is *Pseudomonas mors-prunorum* Wormald. [Dr. Wormald informs us that if this diagnosis is correct it constitutes the first record of the disease from Australia. Ed.]

1223. WILSON, E. E., AND HEWITT, W. B. 632.314 : 634.2

**Host organs attacked by bacterial canker of stone fruits.**

*Hilgardia*, 1939, 12 : 249-55, bibl. 5.

WILSON, E. E.

**Factors affecting development of the bacterial canker of stone fruits.**

*Ibidem*, pp. 259-98, bibl. 22.

Whereas blossom and particularly bud infections are often serious and develop concurrently with outbreaks of limb cankers in stone fruits, leaf, fruit, fruit stem and green shoot infections have not contributed to the severity of infections in trials in California. The organism (*Phytophthora*) appears to be identical with that known in England as *Pseudomonas* spp. In the second article an account is given of experiments made to determine how various factors both external and internal affect canker activity. The factors considered are temperature, fertilizer application, soil moisture conditions and resistance of tree. No very definite conclusions can be drawn.

1224. DU PLESSIS, S. J. 634.8-2.3

**Bacterial blight in vines.**

*Fmg S. Afr.*, 1939, 14 : 55-9.

A bacterial blight of vines which first appeared in S. Africa in 1936 is discussed. The disease is very similar to a bacterial disease reported from the Island of Oleron, France, in 1895. The disease is very infectious and is spread either by the use of scions from diseased plants or by the bacteria exuded from the plant in a dry form and easily carried by the wind to wounded surfaces. The symptoms are described, the initial ones being clearly visible cracks on the green shoots with the surrounding tissue shortly turning dark black-brown. Control measures consist of removing all the diseased parts together with a small portion of the sound wood adjoining.

However drastic this may be, the alternative is a continued infection of the vine. Ordinary dusting or spraying with fungicides should be done immediately after the vineyard has been topped. All trimming cuts should be covered with a fungicide paste immediately. Numerous other common-sense recommendations are made.

1225. THOMAS, H. E., AND ARK, P. A. 632.314 : 634.13 + 634.11

**Some factors affecting the susceptibility of plants to fire blight.**

*Hilgardia*, 1939, 12 : 301-22, bibl. 44.

The size of intercellular spaces is a minor factor in determining infection by *Bacillus amylovorus*. High nitrogen tissues are generally more susceptible than others. There are indications that the concentration of solutes in the nectar as affected by atmospheric humidity affects entry of organism and subsequent development. In girdled apple and pear trees the bark immediately above the girdle is more susceptible than that just below. Etiolation has a relatively slight influence on infection, while defoliation reduces susceptibility. [From authors' summary.]

1226. SEELINGER, R. 632.42 : 634.8

**Beobachtungen über das Auftreten der Perithezien des Echten Mehltaus der Rebe. (Observations on the formation of the perithecia of the true mildew of the vine.)**

*Arb. biol. Reichsanst. Berl.*, 1939, 22 : 453-78, bibl. 51.

The results of studies in 1935 and 1936 at Naumburg an der Saale may be briefly summed up as follows:—The development of the perithecia of *Uncinula necator* was favoured by warm weather conditions. The number of perithecia produced on vines evenly infected with mildew varied with the variety. There was evidence that light checked their production to a certain degree. There was a correlation between the extent of mildew infection and the number of perithecia produced. It was found that the vines on which the fungus appeared earlier were more susceptible than varieties on which it appeared later. No relationship could be established between autumn leaf discoloration and leaf fall and production of the perithecia, or between the osmotic pressure of the foliage of some of the vine varieties studied and infection with mildew or number of perithecia produced. On certain vine varieties the fungus appeared to produce perithecia less readily irrespective of whether mildew infection was slight or extensive.

1227. WOODHEAD, C. E. 634.11-1.542-2.4

**Pruning in relation to mouldy-core of the Delicious apple.**

*N.Z. J. Sci. Tech.*, 1939, 20 : 402A-3A.

The increasing of tree vigour through pruning did not reduce the incidence of mouldy-core disease of Delicious apple in a commercial orchard at Auckland, N.Z. The experiment was carried out by the author for the Plant Research Bureau, D.S.I.R., N.Z.

1228. HOLZ, W. 632.42 : 634.11

**Der Einfluss der März-Temperaturen auf die Geschwindigkeit des Reifungsvorganges von *Venturia inaequalis*-Perithezien. (The effect of March temperatures on the rapidity of maturation process of the perithecia of the apple scab fungus.)**

*Angew. Bot.*, 1939, 21 : 209-14, bibl. 6.

Experiments in Altenland indicate that the perithecia of *Venturia inaequalis* mature the more rapidly, the sooner a temperature total of 105° C. is reached after 1 March. This total is reached by taking the temperature daily at (1) 7.21 a.m., (2) 2.21 p.m. and (3) 9.21 p.m. and counting the sum for the day as  $1 + 2 + 3 + 3$ . This affords a valuable indication of the best time to apply

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the first pre-blossom spray. The author stresses the fact that this sum temperature indicator will have to be determined for each particular district.

1229. HUBER, G. A., AND BAUR, K. 632.42  
**The use of calcium cyanamid for the destruction of apothecia of *Sclerotinia fructicola*.**  
*Phytopathology*, 1939, 29 : 436-41, bibl. 7.  
 Commercial pulverized and oiled calcium cyanamide dusted on the surface of the soil and on the vegetative cover under prune trees at 220 lb. per acre at the beginning of apothecial production in April destroyed the apothecia of *S. fructicola* and prevented development of others.
1230. ELSSMANN, E. 634.23-2.48  
 Prüfung von Sauerkirschensorten auf ihr Verhalten gegen *Sclerotinia cinerea* Schroet. (Testing acid cherries for their resistance to *Sclerotinia cinerea* Schroet.)  
*Forschungsdienst*, 1939, 4 : 361-6.  
 Infection trials with acid cherries at Weihenstephan largely confirmed those at Müncheberg. Results to date are tabulated. The trials are being continued.
1231. HEWITT, W. B., AND LEACH, L. D. 632.42 : 634.2  
**Brown rot sclerotinias occurring in California and their distribution on stone fruits.**  
*Phytopathology*, 1939, 29 : 337-51, bibl. 29.  
 A note on the occurrence of brown rot in the chief stone fruit areas of California. *Sclerotinia laxa* was found everywhere, while *S. fructicola* was more localized.
1232. GRANT, T. J., AND SPAULDING, P. 632.48  
**Avenues of entrance for canker-forming nectrias of New England hardwoods.**  
*Phytopathology*, 1939, 29 : 351-8, bibl. 10.  
 Observations indicate that infection usually occurs through living or dying branches rather than through completely dead branch stubs. In general small stems are more readily girdled than large and autumn and winter injuries are the most important for entrance of infection.
1233. MILLER, P. R. 632.44 : 634.11  
**Pathogenicity, symptoms and the causative fungi of three apple rusts compared.**  
*Phytopathology*, 1939, 29 : 801-11, bibl. 14.  
 The three rust fungi concerned are *Gymnosporangium Juniperi-virginianae*, *G. globosum* and *G. clavipes*. Their symptoms and morphological features are described.
1234. REEVES, E. L., YOTHERS, M. A., AND MURRAY, C. W. 632.4 : 634.11  
**Unusual development of apple perennial canker (*Gloeosporium perennans*) following application of toxic wound dressings.**  
*Phytopathology*, 1939, 29 : 739-43, bibl. 7.  
 MILLER, P. R. 632.44  
**The relation of aeciospore germinability and dissemination to time of infection and control of *Gymnosporangium Juniperi-virginianae* on red cedar.**  
*Phytopathology*, 1939, 29 : 812-7, bibl. 5.
1235. CARTER, W. 632.6/7  
**Injuries to plants caused by insect toxins.**  
*Bot. Rev.*, 1939, 5 : 273-326, bibl. 257, being *Misc. Pap. Pineapple Exp. Stat. Univ. Hawaii* 28.  
 By toxins are meant those substances secreted by insects and introduced into the plant which are toxic to the plant cell, but do not increase in the plant. They cause injuries distinct from those arising from the mere wounds inflicted. With the exception of the gall insects which include species in several orders, all referred to in this review are sucking insects belonging to



the *Homoptera* and *Hemiptera*. The injuries are considered under the following separate headings:—leaf spotting; toxic effects of feeding by *Miridae* (*Capsidae*); tissue derangements by the *Aphididae*; insect galls; hopperburn; froghopper blight; psyllid yellows; mealybug wilt of pineapples. The comprehensive bibliography should be noted.

1236. BOVEY, P., AND LEUZINGER, H. 632.653  
Présence en Suisse de *Ceresa bubalus* F., membracide nuisible d'origine américaine. (***Ceresa bubalus* in Switzerland.**)  
Reprinted from *Bull. Soc. Vaud. Sci. nat.*, 1938, 60 : 193-200, bibl. 9.

*Ceresa bubalus* F., the buffalo tree-hopper, previously unknown in Europe as an injurious insect, has caused serious damage to apple and pear trees in an orchard in the neighbourhood of Sion (Valais).

1237. BOSMA, B. 632.654.2 : 634.1/2  
Spint en spintbestrijding bij vruchtboomen. (**Control of the fruit tree red spider.**)  
*Meded. Tuinbouw-voorlichtingsdienst*, 3, 1937, pp. 28, bibl. 10.

Results are reported here of experiments in Zeeland, in which the efficacy of different sprays and washes against red spider, *Oligonychus ulmi* C. L. Koch, on apples, pears and plum trees was tested.

1238. POPOVA, A. I. 632.752  
**The San José scale.** [Russian, English summary 33 lines.]  
*Plant Protection, Leningrad*, 1939, No. 17, pp. 61-77, bibl. 15.

The occurrence of the San José scale, *Aspidiotus perniciosus* Comst., was first recorded in U.S.S.R. in 1931. It was then found in the Krasnodar province, Georgia and Azerbaijan. Results are reported here of the study made for several years of the pest in the different parts of the U.S.S.R. The more important conclusions may be summed up as follows:—The scale appeared to prefer a temperate to a subtropical climate. Frosts ( $-30^{\circ}$ – $-32^{\circ}$  C.) killed 86.8% of the scales. The number of generations a year was 2 to  $2\frac{1}{2}$  in the northern regions of Krasnodar province and 4 in the southern regions. Under Sochi conditions all generations showed a prevalence of males over females. The number of scales was affected by the fall in temperature in winter and spring, by wind and rain, by predators and the diapause. Its distribution occurred through planting and grafting material and through the agency of wind and transported fruits. The damage to plants and fruits is described. In Russia the source of forest infection was found to be cultivated orchards.

1239. COX, J. A. 632.753 : 634.11  
**A preliminary report on the woolly aphids of apple and hawthorn.**  
*J. econ. Ent.*, 1939, 32 : 477-83, bibl. 5.

A comparison of anatomy and habits of *Eriosoma lanigerum* and *E. crataegi* and a note of transfer experiments with both species. It is noticeable that *Aphelinus mali*, a parasite of *E. lanigerum*, was not reared from *E. crataegi* in field collections, nor would it attack this species under cage conditions either in the field or in the insectary.

1240. BÖRNER, C., AND BRAMSTEDT, F. 632.753 : 634.11  
Über ein Freiland-Ausleseverfahren auf Blutlausfestigkeit von Apfelsämlingen.  
(**Open air trials for testing woolly aphid resistance of apple seedlings.**)  
*Forschungsdienst*, 1939, 3 : 255-9, bibl. 4.

In the injection trials at Naumburg an der Saale it is considered that a single growing period is sufficient to test apple varieties and seedlings for their resistance to woolly aphid. The varieties and seedlings thus tested and found resistant are subsequently used in place of the wild crab for the production of resistant hybrids.

1241. FEYTAUD, J., AND CHABOUSSOU, F. 632.76  
A propos des dégâts causés par *Cantharis obscura* L. sur les fleurs des arbres fruitiers. (**Damage done by *C. obscura* to fruit tree flowers.**)  
*C.R. Acad. Agric. Fr.*, 1939, 25 : 580-4.

*Cantharis obscura* L., an insect which was until recently considered as a beneficial one, has recently been showing the less laudable trait of eating the interiors of the flowers of plums, quince, pears, apples, and cherries at Vic-Bigorre. It has also attacked the young shoots of pears, lilacs and roses. Rotenone powders have proved their value in combating it and it is thought that nicotine may prove effective if used early enough.

1242. FEYTAUD, J. 632.76  
A propos des dégâts de la galéruque de l'aune sur les arbres fruitiers. (**The damage done by *Agelastica alni* L. to fruit trees.**)  
*C.R. Acad. Agric. Fr.*, 1939, 25 : 787-90.

This beetle of the alder, *Agelastica alni* L., has of late years done a certain amount of damage to pear trees and roses, apple and plum trees and walnuts in different parts of Europe, attacking both flower buds and leaves.

1243. CHAPMAN, P. J. 634.22-2.768 : 634.11  
**The plum curculio as an apple pest.**  
*Bull. N.Y. St. agric. Exp. Stat.* 684, 1938, pp. 75, bibl. 30.

This is a study of the life history and habits of *Conotrachelus nenuphar* Herbst, which is a serious pest of apples in the Hudson Valley. Of the insecticides tested in the orchard, lead arsenate and calcium arsenate gave the best results and were about equally effective. The use of lead arsenate at the rate of 3 lb. powder in 100 gallons of water or spray mixture is recommended. Adequate protection of apple orchards against the plum weevil is secured by a calyx or petal fall application, followed by two more sprays, the first 7 to 10 days later and the second 10 to 14 days afterwards. Pre-blossom treatments were ineffective. The use of fish-oil as an adhesive increased the efficiency of spray mixtures.

1244. LATHROP, F. H. 634.73-2.77  
**Ten years of warfare against the blueberry maggot.**  
*J. econ. Ent.*, 1939, 32 : 510-3, bibl. 1.

Fairly satisfactory control has in the past been achieved by two dustings with calcium arsenate at 6 lb. per acre, the first application being made 7-13 days after the emergence of the first flies. Damage to plants, however, and unsatisfactory pollination suggest the possibility of substituting some rotenone insecticide.

1245. BOVEY, P. 632.78 : 634.25  
La tordeuse orientale du pêcher (*Laspeyresia molesta* Busck) nouvel ennemi de nos cultures fruitières. (**The oriental peach moth.**)  
Reprinted from *Rev. hort. suisse*, 1939, Nos. 1 and 2, pp. 15, bibl. 27.

Although control measures against the oriental peach moth on peaches have nearly two pages of this short, illustrated publication, none of the chemical treatments discussed appears to be entirely successful.

1246. ROBERTSON, P. L. 632.78  
**Diamond-back moth investigation in New Zealand.**  
*Bull. Dep. sci. industr. Res. N.Z.* 78, being reprinted from *N.Z. J. Sci. Tech.*, 1939, 20 : 330A-364A.

In New Zealand chemical control measures against the diamond-moth, *Plutella maculipennis*, are impracticable for field crops. The best chance of checking this serious pest appears to lie in the introduction of its natural enemies from abroad.

1247. LISTO, J., LISTO, E. M., AND KANERVO, V. 632.654.2  
 Tutkimuksia hedelmäpuupunkista (*Paratetranychus pilosus* C. and F.)  
 (Studies of the red mite of fruit trees.) [English summary 20 pages.]  
*Valt. Maatalousk. Julk.*, 99, 1939, pp. 143, bibl. pp. 12.

The present publication contains more information on the subject than has been hitherto available\* from Finland. The following problems were studied and are discussed here:—the occurrence of the red mite on different species of plants, damage done, hatching of winter eggs, number of generations, manner of distribution, and natural enemies.

1248. THIEM, H. 632.76 : 634.11  
 Untersuchungen zur Bekämpfung des Apfelblütenstechers (*Anthonomus pomorum* L.). (The apple blossom weevil and its control.)  
*Forschungsdienst*, 1938, 6 : 585-97, bibl. 7.

A single dusting treatment in spring with dinitro-ortho-cresol, derris or pyrethrum (or both) gave a commercial control of the apple blossom weevil, *Anthonomus pomorum* L.

1249. NIKLAS, O. F. 632.768 : 634.13  
 Untersuchungen zur Lebensweise und Bekämpfung des Birnenknospenstechers.  
 (*Anthonomus pyri* Koll. and its control.)  
*Forschungsdienst*, 1939, 7 : 141-7, bibl. 5.

Laboratory trials in Berlin showed that liquid dinitro-ortho-cresol and preparations containing derris or pyrethrum give the best control of the pear blossom weevil, *Anthonomus pyri* Koll.

1250. PARKER, J. R. 632.728  
 Grasshoppers and their control.  
*Fmrs' Bull. U.S. Dep. Agric.* 1828, 1939, pp. 37.

The use of poison baits, adequate tillage and sowing methods, which restrict egg-laying and imprison the young grasshoppers in the ground after hatching, are measures which give the best control of grasshoppers in the United States. Mill-run bran and sawdust bait is particularly recommended. It consists of 25 lb. mill-run bran, mixed feed or shorts,  $3\frac{1}{2}$  bushels of sawdust,  $\frac{1}{2}$  gallon of liquid sodium arsenite and 10-12 gallons of water.

1251. ULLYETT, G. C. 632.963  
 The encouragement of beneficial insects.  
*Bull. Dep. Agric. S. Afr.* 189, 1938, pp. 10, bibl. 4 in text.

This bulletin deals with the natural enemies of indigenous pests of South Africa, including both parasites and predators.

1252. BUCKSTEEG, W. 632.954  
 Erfahrungen bei der Unkrautbekämpfung durch Natriumchlorat auf landwirtschaftlichen Nutzflächen. (Weed control by means of sodium chlorate.)  
*Arb. biol. Reichsanst. Berl.*, 1938, 22 : 349-62, bibl. 26.

In trials at Dahlem the efficacy of  $\text{NaClO}_3$  as a weed killer was found to be largely influenced by type of soil. Not even maximum applications (30 g. per square metre) destroyed all weeds. There was a notable difference in the degree of tolerance of different plants. Thistles, horsetail and couch grass were particularly resistant. In most cases no harmful after effect of the weed killer was observed on plants grown one year or even six months after its application. There was frequently a higher water content in soils that had been given sodium chlorate treatments, than in untreated controls. Under conditions obtaining,  $\text{NaClO}_3$  gave a very satisfactory weed control on all light soils studied without having an undesirable after-effect on crops grown shortly afterwards.

\* See also *H.A.*, 7 : 903.



1253. OWEN, O. 631.544 : 631.453 : 632.954  
**Cleansing chlorate contaminated pots.**

*Twenty-fourth A.R. exp. Res. Stat. Cheshunt 1938, 1939, p. 85.*

Pots contaminated with chlorate weed-killer were effectively cleansed by soaking for 2 hours in a 5% solution of photographic hypo followed by a rinsing in cold water.

1254. CRAFTS, A. S., AND ROSENFELS, R. S. 632.954  
**Toxicity studies with arsenic in eighty California soils.**

*Hilgardia*, 1939, 12 : 177-200, bibl. 16.

ROSENFELS, R. S., AND CRAFTS, A. S.

**Arsenic fixation in relation to the sterilization of soils with sodium arsenite.**

*Ibidem*, pp. 201-29, bibl. 15.

CRAFTS, A. S.

**Toxicity studies with sodium chlorate in eighty California soils.**

*Ibidem*, pp. 231-47, bibl. 13.

Three interesting articles on soil toxicity effects of three commonly used herbicides.

1255. MARTIN, J. T., AND TATTERSFIELD, F. 632.951  
**The trend of progress—insecticides.**

*Chemistry and Industry*, 1939, 58 : 635-40, bibl. 50  
and

MARTIN, H.

632.952

**The trend of progress—fungicides.**

*Ibidem*, 1939, 58 : 641-3, bibl. 11.

These two reviews of the position reached by those investigating the control of damage done by insects and fungi not only give the horticulturist a clear idea of progress made but also show him the difficulties involved. Of the contact insecticides perhaps derris and pyrethrum take pride of place, but among stomach poisons some of the synthetic compounds are of particular interest to horticulture, notably phenothiazine (thiodiphenylamine). The authors also note the interesting work on other synthetic compounds, on fumigants, and on attractants and repellants. They note that the effect of radiation on insects is receiving attention and that counter-parasite work is in progress. Finally they stress the need for paying special attention to instances of acquired increased resistance of insects to insecticides. Fungicides and the problems involved are rather more generally treated. The number of established active constituents of fungicides is limited to sulphur, copper, mercury, formaldehyde and one or two other materials. Little is yet known as to how they exert their toxicity.

1256. MARTIN, J. T., MANN, H. H., AND TATTERSFIELD, F. 632.951 : 631.8  
**The manurial requirements of pyrethrum (*Chrysanthemum cinerariae-folium* Trev.)**

*Ann. appl. Biol.*, 1939, 26 : 14-24, bibl. 8.

In this experiment, which took place at Woburn, England, on a sandy soil of low fertility, lime produced small but not significant yearly increases in yield of flowers and pyrethrin content, and decreased the percentage of plant failures in the 4th and 5th years. The yearly application of moderate dressings of manures, both organic and artificial, significantly increased flower production in the 2nd and 5th years and significantly increased pyrethrin I content of flowers in the 4th and 5th years.

1257. TAGGIASCO, G. 632.951  
**La coltivazione del piretro. (Pyrethrum growing.)**  
*Pubbl. Staz. sper. Flor. O Raimondo, Sanremo*, 29, 1938, pp. 10, being reprinted  
from *Costa azzurra agricola floreale*.

After noting that of late years both Kenya and Japan have come into the market as producers, the author gives a full account of recommended methods for growing, harvesting and drying pyrethrum. He considers that many of the otherwise not cultivated soils of Italy and her islands, as also the uplands of Abyssinia, should prove excellent for its cultivation.

1258. KELSALL, A. 632.95

**Thirty years' experience with orchard sprays in Nova Scotia.**

*Sci. Agric.*, 1939, 19 : 405-10.

An outline of the developments of the last thirty years of spraying in Nova Scotia which have led to the schedules at present followed.

1259. SHAW, H. 632.951

**The problem of spray residues on orchard fruit.**

*Chemistry and Industry*, 1939, 58 : 65-6, bibl. 6.

Spray residues are objectionable on three grounds, namely, toxicity, deleterious influence on processing and unpleasant appearance of fruit. To obviate these in some cases it is possible to change the timing of the spray, in some it may be possible to control the pest at another stage in its development, in others the substitution of a non-poisonous spray may be the solution. The author suggests that our brightest hope at present appears to lie in the extended use of vegetable insecticides and the introduction of new substances from the wide range of synthetic chemicals now under investigation.

1260. DRIGGERS, B. F., AND O'NEILL, W. J. 632.78

**Experiments with nicotine for the control of codling moth.**

*J. econ. Ent.*, 1939, 32 : 286-90, bibl. 2.

HAMMER, O. H.

632.754 : 634.11

**The tarnished plant bug [*Lygus pratensis* L.] as an apple pest.**

*J. econ. Ent.*, 1939, 32 : 259-64, bibl. 3.

Feeding punctures resulting in dimpling of fruit surface.

HSIAO, T. Y., AND MOTE, D. C.

632.78 : 634.23

**The cherry casebearer, *Coleophora pruniella* Clem. in Oregon.**

*J. econ. Ent.*, 1939, 32 : 363-5.

JOHNSON, G. V., AND FENTON, F. A.

634.11-2.76

**Control of the flatheaded apple tree borer [*Chrysobothris femorata* Oliv.] in Oklahoma.**

*J. econ. Ent.*, 1939, 32 : 134-42, bibl. 9.

LAMIMAN, J. F.

632.654.1 : 634.13

**Pear bud injury and the pear leaf blister mite [*Eriophyes pyri* Pgst.]**

*J. econ. Ent.*, 1939, 32 : 40-3, bibl. 5.

MARKWOOD, L. N.

634.11-2.951.1

**The photometric determination of nicotine on apples, without distillation.**

*J. Assoc. off. agric. Chem., Wash.*, 1939, 22 : 427-36, bibl. 9.

A method suitable for rapid mass operation.

MÜLLER, K.

634.8-2.951.23

**Arsenvergiftungen bei Winzern. (Arsenical poisoning symptoms among viticultural labourers.)**

*Angew. Bot.*, 1939, 21 : 189-209.

PETCH, C. E.

632.95

**Evaluating orchard spray materials—a progress report.**

*Sci. Agric.*, 1939, 19 : 424-34, bibl. 29.

SIEGLER, E. H., MUNGER, F., AND SMITH, L. E.

632.78

**Toxicity to the codling moth larva of derivatives of benzene containing halogen and nitro groups.**

*J. econ. Ent.*, 1939, 32 : 129-31.

BALCH, R. E.

632.78

**Further notes on the fall cankerworm and its control by "solid-stream" spraying.**

*Sci. Agric.*, 1939, 19 : 411-23, bibl. 10.

*Alsophila pometaria* an autumn pest of elms.

## VEGETABLE GROWING, STIMULANTS, AND FIBRES.

1261. BARTON, L. V. 635.1/7 : 631.531 : 664.84

**A further report on the storage of vegetable seeds.**

*Contr. Boyce Thompson Inst.*, 1939, 10 : 205-20, bibl. 16.

By reduction of moisture content of containers to approximately 6-8% the viability was greatly prolonged (6 years to date) of seeds of lettuce, onion, cauliflower, tomato and carrot held at room temperature, but if the seeds were air-dried before sealing then none survived a longer period than two years. Egg plant seeds remained viable for six years at room temperature regardless of moisture content. Germination tests of old and fresh seeds stored for short periods at various humidities and temperatures indicated that at relative humidities above 50% safe storages were 20° C. or lower, a fact of importance in commercial packing of seeds after removal from favourable storage conditions.

1262. VOGEL, F. 635.1/7 : 631.8

**Düngung und Geschmack bei Gemüse. (The effect of manuring on flavour of vegetables.)**

*Forschungsdienst*, 1938, 6 : 551-6, bibl. 31.

The chemical constitution of the different vegetables varies to a very large extent and hence the effect of different manurial treatments on flavour will vary. *Cabbage* was best flavoured when given complete fertilizer and organic manure. *Celery* and *carrots* did not appear to gain from treatments with complete fertilizer or complete fertilizer + farmyard manure, and no fertilizer or farmyard manure alone gave better results. *Scorzonera* had a better flavour and contained more sugar and less fibre when given complete fertilizer and farmyard manure than when given manure alone. *Cucumbers*. Results are rather conflicting and appear to vary with the type of cucumber, i.e. whether the fruits are intended for pickling, canning, eating in the fresh state, etc. *Tomatoes* had the best flavour when given complete fertilizer + farmyard manure. This was not the case with canned tomatoes. Increased amounts of potash tended to improve the flavour, while liberal amounts of nitrogen impaired it. On sandy soils tomatoes had the best flavour when given complete fertilizer and on clayey soils when given farmyard manure. *Peas* and *beans* lacking manure and potash had a poorer flavour when canned than those receiving organic and mineral manure. *Peas* grown on sandy soil had the best flavour when given farmyard manure alone. Canned *asparagus* had the best flavour when it came from plots receiving complete fertilizer. *Lettuce* was best when given complete fertilizer. The gist of particular experimental results with a large number of vegetables is set out in this article.

1263. NETTLES, V. F. 635.1/7 : 631.8

**Results from three methods of applying fertilizer to certain vegetables.**

*Proc. Amer. Soc. hort. Sci. for 1938, 1939*, 36 : 505-8, bibl. 3.

At Florida Experiment Station crops requiring a short growing season, such as cucumber, produce a greater yield when fertilizer is applied down the rows (by machine in this case) because the nutrients more quickly reach the roots. Peppers and tomatoes with a long growing season receive more benefit when the manure is broadcast. The natural fertility of the soil and moisture-holding capacity may also influence the effectiveness of the method of application.

1264. TIEDJENS, V. A., AND WALL, M. E. 635.1/7 : 631.83

**The importance of potassium in the growth of vegetable plants.**

*Proc. Amer. Soc. hort. Sci. for 1938, 1939*, 36 : 740-3, bibl. 8.

The paper presents a summary of results of experiments on the effect of potassium on plant metabolism in the case of the Rutgers tomato. The work was carried out at the New Jersey Experiment Station. It is concluded from the observations which are described that calcium



and potassium antagonize one another and that the decrease in carbohydrate formation in cases of potassium deficiency may be due to injury of protoplasm, resulting from lack of ion balance, rather than to any specific catalytic action of potassium.

1265. BREMER, A. H. 635.1  
Dyrking av matnyttige røtter. (**Cultivation of edible roots.**)  
*Publ. Stat. Forsøksta. Grønsak.*, 1939 (?), pp. 20.

Suggestions are made for improvements in the cultivation and storage of various root vegetables under Norwegian conditions.

1266. MUNCIE, J. H. 635.1/7 : 632.1/4 + 632.8  
**Controlling vegetable diseases in seedbed and coldframe.**  
*Ext. Bull. Mich. agric. Exp. Stat.* 200, 1939, p. 1.

Notes on soil disinfection by means of steam sterilization or chemicals are followed by brief directions as to seed treatment for the more important vegetable crops.

1267. VOGEL, F., AND VON HÖSSLIN, R. 631.8 : 635.34  
Düngung des Weisskrautes bei Ausdehnung des Anbaus auf Neuland.  
(**The manuring of white cabbage growing on newly reclaimed land.**)  
*Ernähr. Pfl.*, 1939, 35 : 193-4.

Experiments with white cabbage on newly reclaimed land at Ismaning showed that the soil was deficient in potash. The best yields were obtained from plots that were given farmyard manure and complete fertilizer, while farmyard manure plots yielded better than farmyard manure + N plots.

1268. PAL, B. P., AND NATH, P. 633.491  
**Shortening the rest period of the potato (*Solanum tuberosum* L.).**  
*Indian J. agric. Sci.*, 1938, 8 : 777-86, bibl. 21.

In several districts in India two or three crops of potatoes are raised in a year. Since potatoes require a rest season it is not possible to use the tubers for planting successive crops. Experiments were carried out by the Imperial Agricultural Research Institute, Delhi, to ascertain whether American methods of breaking the rest season were applicable to India. The method giving the quickest and most uniform results was peeling the potato except for a small portion of skin round each eye. The ethylene chlorhydrin vapour method for whole tubers and the ethylene chlorhydrin dip method for cut tubers were moderately successful, and the ethylene chlorhydrin dip method for whole tubers was inferior to all except the untreated controls. The effect on yield is not known, though evidence from Japan seems to indicate that it is certainly not diminished but probably increased owing to the longer growing period of treated plants. All the methods present difficulties to the commercial grower though useful to potato breeders and geneticists. There are varietal differences in quickness of response to treatment.

1269. KIMBROUGH, W. D. 633.491  
**The effect of length of dormant period of seed Irish potatoes on yield.**  
*Proc. Amer. Soc. hort. Sci. for 1938*, 1939, 36 : 590-2, bibl. 2.

The yields of Irish potatoes at Louisiana Experiment Station were greatly influenced by length of dormancy before planting of the seed tubers producing the crop. Seed with 9 months' dormancy always produced lower yields than that with 5 months' dormancy. Three months' dormancy gave erratic results, but this may have been because the potatoes to provide the seed for this crop had to be planted late and as a result of weather conditions did not always mature properly. For best results the dormant period should be long enough for the seed pieces to sprout rapidly when planted and to grow vigorously, but not long enough to produce multiple sprouting and stunted, easily maturing plants.

1270. THORNTON, N. C. 664.84.21.035.1 + 633.491  
**Carbon dioxide storage. XIII. Relationship of oxygen to carbon dioxide in breaking dormancy of potato tubers.**

*Contr. Boyce Thompson Inst.*, 1939, 10 : 201-4, bibl. 3.

Carbon dioxide is most effective in breaking the dormancy of potato tubers when it acts in the presence of 20% or more of oxygen and this treatment is more effective than a completely anaerobic condition brought about by treatment with nitrogen. Optimum concentrations of carbon dioxide are 10-60% in combination with 20-80% of oxygen which will, with a period of 5-7 days of treatment, cause the emergence of sprouts from 50% of one-eye pieces in soil within 17-30 days as compared with 44-78 days for the controls. [From author's summary.]

1271. THORNTON, N. C. 664.84.21.035.1 : 633.491  
**Oxygen regulates the dormancy of the potato.**

*Contr. Boyce Thompson Inst.*, 1939, 10 : 339-61, bibl. 14.

The experimental results in this paper show, contrary to generally accepted theories, that dormancy in potatoes arises because the bud tissue obtains too much rather than an insufficient supply of oxygen, that the skin of the young tuber is more permeable rather than less permeable to oxygen, that the skin of the tuber becomes less permeable with age and that peeling or otherwise wounding the dormant tuber brings about a condition that retards rather than facilitates the entrance of oxygen. [From author's summary.]

1272. EDMUNDSON, W. C. 633.491-1.67  
**Time of irrigating potatoes as affecting stolon and tuber set and development.**

*Circ. U.S. Dep. Agric.* 496, 1938, pp. 17, bibl. 6.

The results of irrigation experiments on two potato varieties at the Colorado Potato Experiment Station, Greeley, may be summed up as follows : Early applications of irrigation water (starting on July 12) on Rural New Yorker No. 2 and Triumph plants had little or no effect on the number of stolons produced per hill, but they caused a much more rapid growth and development of stolons. The shortest stolons of both varieties were produced in the early irrigated plots in the year in which the soil temperature was the lowest. In years of high soil temperature some Triumph plants in the late irrigated plots (31 July) developed long stolons with aerial stems with no tubers, the tubers developing on shorter stolons. Plants of both varieties that received early irrigation treatment produced an early set and a more rapid development of tubers than did the plants of the same variety that received the initial irrigation later in the season. Early irrigation had little effect on the total number of tubers produced per hill of either variety, but produced a larger number of tubers weighing over 85 g.

1273. SMIETON, M. J. 635.34/5 : 632.42  
**On the use of chlorinated nitrobenzenes for the control of club root disease of *Brassicæ*.**

*J. Pomol.*, 1939, 17 : 195-217, bibl. 3.

Trichlordinitrobenzene (substance B) sometimes equalled mercuric chloride in efficiency and was superior to pentachloronitrobenzene (substance A) in controlling club root (*Plasmodiophora Brassicæ*) of cauliflowers and cabbages in seed beds. The results with both A and B as regards any check to the plants and destruction of the fungus depended materially on whether the filler was chalk or lime ; e.g. in trichlordinitrobenzene chalk caused less check, while lime gave a greater disease control. The work was carried out at the Field Station of the Imperial College of Science and Technology, Slough, England.

1274. FLINT, L. H., AND MORELAND, C. F. 635.52 : 612.014.44  
**Response of lettuce seedlings to 7600A radiation.**

*Amer. J. Bot.*, 1939, 26 : 231-3, bibl. 4.

Radiation at 7600A stunted the growth of lettuce seedlings. The effect was not associated with assimilation or with temperature. Radiation at 6500A and at 8500A had no stunting effect. Radiation at 7600A incited no phototropic response in lettuce seedlings. [Authors' summary.]

1275. WOODMAN, R. M. 635.52 : 631.84  
**Studies in the nutrition of vegetables. The effects of variation in the nitrogen\* supply on lettuce (var. May King) in sand culture.**  
*Ann. Bot., Lond.*, 1939, 3 : 649-56, bibl. 2.

Experiments were made at the Horticultural Research Station, School of Agriculture, Cambridge, in glazed culture-jars each holding about 46 lb. of a fine white pure silica sand. To these different nutrient solutions were added and in them May King lettuce seed was sown. Notes were made of the subsequent tinting of cultures, scorch, size, hearting, root formation and market grade. Decreasing the amount of N, given as sodium nitrate, resulted in a progressive reduction in size and weight of plant, a progressive development of anthocyan pigment and finally a tendency to etiolation of the remaining green parts of the leaves with sometimes formation of golden yellow colour in the oldest leaves. Adequate N resulted in good hearts and the growth of top rather than root.

1276. AINSWORTH, G. C. 635.52 : 632.8  
**Virus diseases. Lettuce mosaic.**  
*Twenty-fourth A.R. exp. Res. Stat. Cheshunt 1938*, 1939, pp. 60-1.

Transmission of virus disease through one-, two- and three-year-old seed of lettuce was confirmed. No lettuce variety tested proved immune but it was possible to group varieties into mildly and severely affected classes, the latter in all the forcing types. Groundsel proved to be a dangerous host plant of the virus since overlapping generations occur all the year round.

1277. CRANDALL, F. K., AND ODLAND, T. E. 635.53 : 631.8  
**The response of early celery to fertilizer ingredients.**  
*Proc. Amer. Soc. hort. Sci. for 1938*, 1939, 36 : 523-5, bibl. 1, being *Contr. R.I. Exp. Stat.* 542.

Increasing nitrogen by 50% in a standard 6.8.6 fertilizer increased yields of celery by 33 dozen bunches per acre, while reducing the nitrogen 50% below the standard reduced yields. Similar increase in potash increased the yield of celery by 86 dozen bunches per acre. There was less decrease in average yield when potash was decreased than when nitrogen was decreased. Phosphorus had little effect on yield. Quality was unaffected by variation in these elements.

1278. BECKENBACH, J. R. 635.53 : 631.8  
**A fertility program for celery production on Everglades organic soils.**  
*Bull. Fla agric. Exp. Stat.* 333, 1939, pp. 39, bibl. 7.

On the basis of experimental results manurial programmes are suggested for the commercial cultivation of celery on three different types of soils of the Florida Everglades, namely (1) virgin sawgrass peat soil ; (2) sawgrass peat soil previously fertilized and planted to truck crops other than celery ; and (3) sawgrass peat soil previously fertilized for and planted to celery. The common methods of cultivating celery in that area are discussed very briefly.

1279. MARCEL, M., AND BARBIER, G. 635.561 : 631.8  
 Sur la fumure des cressonnières.† (**The manuring of watercress.**)  
*C.R. Acad. Agric. Fr.*, 1939, 25 : 841-7.

The following points affecting the manuring of watercress are dealt with :—(1) Chlorosis due to excess of phosphoric acid. It would appear better to use less phosphatic manure and so avoid the later use of sulphate of iron which appears to remedy the chlorosis, since it also tends to increase the algae in the beds. (2) Sulphur requirements. Provided the water used contains 3 mg.  $5\text{SO}_3$  per litre this should suffice. (3) The different forms in which phosphoric acid should be applied. The less soluble forms are to be preferred. (4) Phosphoric acid in watercress soils. The water in contact with the soil is found to be very much richer in  $\text{P}_2\text{O}_5$  than the irrigation water. The penetration of  $\text{P}_2\text{O}_5$  into the soil is limited to a few centimetres only. As regards

\* For papers on phosphate and potash nutrition of lettuce see *H.A.*, 1939, 9 : 910, 911.

† See also *Ibidem*, 1938, 24 : 193-200, *H.A.*, 8 : 1096.



new plantings it is suggested that a complete fertilizer should be given prior to sowing. This should contain a very small proportion of N and a very much larger proportion of  $P_2O_5$  which will come into use in course of time. There is in this case no objection to the use of a soluble phosphate such as superphosphate.

1280. BOSHART, K. 631.811.3 : 635.65

Die Kalidüngung der Buschbohne. (**The use of potash on dwarf beans.**)

*Ernähr. Pfl.*, 1939, **35** : 172-5, bibl. 6.

Experiments at Holzapfelkreut (Bavaria) showed that the dwarf bean responds well to mineral fertilizers, provided the soil contains sufficient organic matter. Increasing the potash from 70 to 110 lb.  $K_2O$  per acre resulted in a substantial increase in yield. A further increase to 145 lb. per acre produced increases in yield in 50% of the cases observed. Sulphate was superior to muriate. The returns fully justified the use of potash fertilizers, the greatest profit being obtained from the heaviest application of  $K_2O$  in the form of sulphate of potash.

1281. SHIRLOW, N. S. 635.651/3

**Varieties of garden beans in New South Wales.**

*Fmrs' Bull. Dep. Agric. N.S.W.* **171**, 1938, pp. 44, bibl. 12.

New South Wales beans are here discussed under the headings: beans of the genus *Phaseolus*, beans other than genus *Phaseolus*, varieties in relation to disease resistance, broad beans. An index of bean varieties is included.

1282. LEWIS, A. H. 635.656 : 632.19

**Manganese deficiencies in crops. I. Spraying pea crops with solutions of manganese salts to eliminate marsh spot.**

*Emp. J. exp. Agric.*, 1939, **7** : 150-4, bibl. 3.

Three field experiments conducted on Romney Marsh by Jealott's Hill Research Station show that the incidence of marsh spot in peas was unaffected by heavy soil dressings of soluble manganese salt when applied at sowing time, but slightly affected when similar applications were made when the plants were in flower. Spraying the foliage at flowering time with a solution of 5-20 lb. manganous chloride per acre was much more effective than applying much greater quantities to the soil. Spraying carried out at other times than flowering time was much less effective. Manganese appeared sometimes to increase yields.

1283. MULLISON, W. R. 631.531 : 631.454

**Effect of calcium deficiency on respiration of etiolated seedlings.**

*Bot. Gaz.*, 1939, **100** : 828-35, bibl. 11, being *Contr. Hull bot. Lab.* **500**.

Studies on the effect of calcium deficiency on the rate of respiration of peas, maize and squash showed the total respiration of the minus calcium plants to be in every case less than that of the plus calcium plants. The lowered rate of respiration was most marked in the minus calcium tops compared with the plus calcium tops.

1284. WILCOXON, F., AND HARTZELL, A. 632.944 : 631.544

**Experiments on greenhouse fumigation with dichloroethyl ether.**

*Contr. Boyce Thompson Inst.*, 1939, **10** : 47-55.

$\beta$ ,  $\beta^1$ -dichloroethyl ether controlled *Aphis rumicis*, red spider mite, gladiolus thrips and adult white fly when used as a fumigant in greenhouses. It was more effective than naphthalene. The most successful way of applying it to combine maximum plant tolerance with maximum pest control was by volatilization of the pure material by means of an electric fan; to aid this porous carbon plates were suspended over the shallow pans containing the liquid in such a manner that the bottom edge dipped into the liquid. Unlike naphthalene the fumigant does not impart a permanent odour or taste to the fruits.

1285. BEWLEY, W. F. 635.64 + 635.63

**Experimental results of 1938.**

*Twenty-fourth A.R. exp. Res. Stat. Cheshunt 1938, 1939, pp. 21-38.*

*Tomatoes.* In the greenhouse plants grown in 9-in. clay pots or in wooden or cardboard boxes 6×6×6 in. or 8×8×8 in., each having a drainage hole 2 in. square at the bottom, produced earlier and heavier yields of good quality fruit than plants in the ground. Plants severely attacked by eelworms were brought back to health after chemical soil sterilization had failed by spreading the soil with a layer of moist peat 1 in. thick. New roots grew out quickly into the peat and were not severely attacked. The effect was seen 10 days after the peat had been laid down. *Cucumbers.* Experiments were concerned with the composition of the beds. The mixture of 2 parts soil and 1 part straw to which dried blood was added is inferior to 2 parts soil, 1 part horse manure. Contrary to results obtained in many nurseries the addition of 1 part straw to the latter mixture did not increase yield nor did the addition of peat. Chemical sterilizers were tested at the same time, the best yields being obtained when formaldehyde was used.

1286. KRONE, B. P.\* 635.64 : 631.544

**Glasshouses for tomato culture.**

*J. Dep. Agric., Vict., 1939, 37 : 319-22, 338.*

Instructions are given for the building of an unheated glasshouse 100 ft. × 15 ft., height of gable 6 ft. 6 in., height of eaves 3 ft. 6 in. The total cost of materials, chiefly timber, galvanized iron, rafters and glass, is between £65 and £75 in Victoria, Australia.

1287. GOODALL, D. W., AND BOLAS, B. D. 635.64 : 581.143.26.03

**Experiments on the vernalisation of tomato seeds.**

*Twenty-fourth A.R. exp. Res. Stat. Cheshunt 1938, 1939, pp. 90-6, bibl. 2.*

In vernalization experiments with tomato seed the effect of chilling the seed after it had been kept under germination conditions for some days was unfavourable both to growth and fruiting. Favourable results in earlier fruiting were obtained, however, when the moist seed was chilled at 1° C. for 49 days before being germinated at 20° C. without further addition of water for 10 days. Further research in this direction is proceeding.

1288. BOULLE, M. 635.64

Le maturité de la tomate. [**Maturity tests for tomato.**] [Flemish, French and English summaries.]

*Bull. Inst. agron. Gembloux, 1939, 8 : 26-32, bibl. 8.*

Comparative tests to determine maturity indexes in tomato have been carried out by chemical and refractometrical methods. There are numerous difficulties when analytical results are being compared and the figures vary not only with the variety but with the conditions under which the plant is grown.

1289. LEWIS, A. H., AND MARMOY, F. B. 635.64 : 631.8

**Nutrient uptake by the tomato plant.**

*J. Pomol., 1939, 17 : 275-83, bibl. 7.*

The course of uptake by the tomato plant of 12 elements considered as N, P<sub>2</sub>O<sub>5</sub>, CaO, MgO, K<sub>2</sub>O, Na<sub>2</sub>O, Fe, Mn, Cu, Cl, SO<sub>4</sub>, B, was studied at Jealott's Hill Research Station. The rate of nutrient uptake follows the rate of dry matter production, being slow in the early stages, rising to a maximum in June and July and then declining. A balanced fertilizer for tomatoes would be N : P<sub>2</sub>O<sub>5</sub> : K<sub>2</sub>O = 1 : 1 : 2, which should be varied in amount of application according to the stage and rate of growth.

\* Articles by the same author on tomato culture out of doors in Victoria have appeared *Ibidem*, 37 : 64-7, 164-7, 271-4. The subjects included seed sowing, hotbed, cold frame, planting out, irrigation, manures.

1290. WALL, M. E. 635.64 : 631.83  
**The rôle of potassium in plants. I. Effect of varying amounts of potassium on nitrogenous, carbohydrate and mineral metabolism in the tomato plant.**  
*Soil Sci.*, 1939, 47 : 143-61, bibl. 29.

The work recorded in this paper was carried out at the New Jersey Experiment Station, U.S.A. The symptoms of potassium deficiency are discussed, and evidence is presented that environmental conditions in relation to changes in internal metabolism due to potassium deficiency are primarily responsible for the different deficiency symptoms that have been noted. Deficiency in potassium seems to curtail protein synthesis. This seems to occur in the stage amino acid-protein after amino acids have been formed. Accumulation of nitrates and carbohydrates is explained on a partial mass action effect rather than on a direct retardation in nitrate assimilation. The final decrease in carbohydrates in potassium deficient plants is due to the effects of a decrease in assimilation and an increase in respiration. Potassium deficient plants show an increase in the absorption of other ions, particularly phosphate, although this is partially masked by the effects of substituting sodium for potassium. Preliminary evidence is given of a low concentration of potassium which is not only an optimum supply, but is also close to a minimum supply for tomatoes in sand culture under the experimental conditions. The possible bearing of the antagonism of calcium to potassium in relation to carbohydrate assimilation and growth is discussed. [Author's summary.]

1291. WATTS, V. M. 635.64 : 632.19 : 631.8  
**Anatomical symptoms of nitrogen, phosphorus and potassium deficiencies in seedling hypocotyls of tomato (*Lycopersicum esculentum* Mill.).**  
*Bull. Ark. agric. Exp. Stat.* 366, 1938, pp. 32, bibl. 11.

N deficiency, P deficiency and complete lack of nutrients resulted in greatly retarded growth of the mid-winter and late spring tomato seedlings. K deficiency had a less marked retarding action. N and P deficiencies and complete absence of nutrients resulted in small cells in all tissues, limited amounts of cambium and thin cell walls in the woody tissues as compared with the conditions in plants receiving complete nutrient treatments and in K deficient plants. K deficiency in mid-winter seedlings resulted in the highest ratios of conducting tissue to other tissues. This effect of K deficiency was less marked in late spring seedlings.

1292. ROMSHE, F. A. 635.64  
**Growth, production and fruit quality of tomatoes grown under cloth.**  
*Proc. Amer. Soc. hort. Sci. for 1938, 1939*, 36 : 692-4, bibl. 2.

At the Experiment Station, Oklahoma, tomatoes grown outside often suffer from sun scald and poor fruit set. When the plants were grown in a cloth house sun scald and blossom end rot were prevented and the yields increased. The number of flowers per cluster and the percentage which set fruit were also increased.

1293. STIER, H. L., AND DUBUY, H. G. 635.64 : 577.15.04  
**The influence of certain phytohormone treatments on the time of flowering and fruit production of tomato plants under field conditions.**  
*Proc. Amer. Soc. hort. Sci. for 1938, 1939*, 36 : 723-31, bibl. 4, being *Sci. Contr. Dep. Hort. Bot. Md Exp. Stat.* 489.

Treatment of tomato seed with auxin-talc dust mixtures and subsequent treatment of the plants with solutions of indolylbutyric or naphthylacetic acid at the time of transplanting to the field gave with some combinations and concentrations (a) marked acceleration of the time of anthesis of flowers, (b) higher yields during the first month of fruiting, (c) higher total yields for the season. The most successful results in (a), (b) and (c) were obtained with a dust treatment of 10 milligrams naphthylacetic acid to 10 grams talc applied at the rate of 15 milligrams per 50 seeds, followed by dipping the roots for 2 seconds at transplanting into a 10 parts per million aqueous solution of indolylbutyric acid. Dipping roots in a naphthylacetic acid concentration of 10 parts per million inhibited flowering and fruiting except when indolylacetic acid had been used in the dust treatment of the seeds.



1294. HARRISON, A. L., YOUNG, P. A., AND ALTSTATT, G. E. 635.64 : 632.3/4  
**Control of tomato diseases in the seed bed and cold frame.**  
*Circ. Tex. agric. Exp. Stat.* **82**, 1939, pp. 14.

In Texas precautionary measures against the pre-emergence damping off of tomato seedlings consist of seed treatments with Cuprocide, Metrox, 2% Ceresan, or Semesan. Post-emergence damping off is held in check by drenching the surface of the soil with a solution of either Semesan or Cuprocide "54", by adequate ventilation and plenty of sunshine. The control of damping off in the seed bed is greatly facilitated by the use of fresh soil each season. Thorough applications of 3-3-50 bordeaux mixture or 1½ lb. to 50 gall. Cuprocide "54" will control collar rot, and spraying with bordeaux mixture at intervals of 10-14 days will control leaf spot and leaf blight. For the control of mosaic all weeds should be destroyed near the hotbed, all affected tomato plants removed and the use of tobacco avoided while handling the seedlings. The soil should be free of nematodes.

1295. IVAKHNENKO, A. N. 635.64 : 632.1/4  
**Tomato diseases.** [Russian, English summary 39 lines.]  
*Mem. Kharkov agric. Inst.*, 1938, 1 : 2 : 179-282, bibl. 136.

This study of tomato diseases in Ukraine comprises 6 principal sections, namely :—(1) type of disease encountered and description ; (2) biology of the causal organisms as associated with plant infection ; (3) importance of the principal diseases ; (4) varietal susceptibility of tomatoes to certain diseases ; (5) agricultural practices helping to control diseases ; and (6) control measures. The large bibliography should be noted.

1296. HUELSEN, W. A. 635.64 : 632.48  
**Wilt-resistant tomato varieties released by the Illinois Station.**  
*Circ. Ill. agric. Exp. Stat.* **490**, 1939, pp. 22.

Nine tomato varieties are here described that are resistant to *Fusarium* wilt. Five of these varieties, which were all bred at the Illinois Agricultural Experiment Station, are only suitable for growing in the greenhouse.

1297. BEST, R. J. 635.64 : 632.8  
**The preservative effect of some reducing systems on the virus of tomato spotted wilt.**  
 Reprinted from *Austr. J. exp. Biol. med. Sci.*, 1939, **17** : 1-17, bibl. 9.

The effect of various reducing systems on the activity of suspensions of the virus of tomato spotted wilt has been tested. Hydrogen in the presence of platinized platinum arrested the normal aerobic inactivation of the virus, and thereafter maintained the activity at a constant level for the duration of the experiment (eight hours). Suspensions of the virus in the presence of cystein and absence of oxygen have been kept in an active state for 35 days as compared with the normal *in vitro* life of a few hours. The sodium salts of glutathione, thioglycollic acid and ascorbic acid (all buffered at pH 7) preserved the virus against the slow inactivation which takes place in the absence of oxygen. Redox potentials of the test systems are recorded and discussed in relation to the relative efficiencies of the protective agents. [Author's summary.]

1298. WEBER, G. F. 635.64 : 632.4  
**Blossom-end rot of tomatoes.**  
*Pr. Bull. Fla agric. Exp. Stat.* **524**, 1938, pp. 2.

Under Florida conditions improved cultural practices, especially regarding the water supply of the plants, are said to give a certain measure of control of blossom-end rot of tomatoes. Sudden flooding or drought usually result in the development of the disease. Bordeaux spray increases the demand for water by the plant and may be sufficient to cause the disease in plants close to the danger mark. Staking and pruning exposes more of the leaf surface area to drying conditions, thereby increasing the rate of evaporation, and may also cause blossom-end rot.

1299. CEYLON, DEPARTMENT OF AGRICULTURE. 635.64 : 632.19

**Blossom-end rot of tomato fruits.**

*Leaflet. Ceylon Dep. Agric.* 119, 1937, pp. 2.

Control measures against blossom-end rot of tomatoes consist of watering the plants during very dry weather, good drainage and aeration of the soil, prevention of excessive transpiration and avoidance of the use of fresh cattle manure and large quantities of fertilizers.

1300. GUBA, E. F. 635.64 : 632.48

**Control of tomato leaf mold\* in greenhouses.**

*Bull. Mass. agric. Exp. Stat.* 361, 1939, pp. 33, bibl. 56.

Tomato leaf-mould, caused by *Cladosporium fulvum* Cke., is a serious disease of greenhouse tomatoes in Massachusetts. The successful control of the disease involves many different factors such as cultural practice, greenhouse management, maintenance of right temperature and air humidity, as well as the usual greenhouse hygiene. The use of fungicidal sprays and dusts is not effective on account of the unsatisfactory protection of the lower surfaces of tomato leaves and conditions peculiar to greenhouse culture. The vaporization of sulphur at regular, short intervals in spring and autumn is an efficient contributory method of control. The most economical and practical method of control is sulphur burning. The burning of 4 lb. of sulphur to 10,000 cubic feet (under relatively dry conditions to avoid plant injury) is lethal to tomato leaf-mould spores, plant life and the common insects, except red spider mite.

1301. WEBER, G. F. 635.64 : 632.48

**Nailhead spot of tomato (caused by *Alternaria tomato* (Cke. n. comb.)).**

*Bull. Fla agric. Exp. Stat.* 332, 1939, pp. 54, bibl. 83.

Nailhead spot caused by *Alternaria tomato* (Cke. n. comb.), is an important disease of tomatoes in Cuba, West Indies, Mexico and southern United States. Its hosts consist of tomato, potato, eggplant and horse nettle. The various phases of the disease are described and certain physiological and morphological characteristics of the fungus are discussed. Pathogenicity of the parasite has been proved and pathological anatomy of the disease demonstrated and explained.

1302. KATZER, A. 632.4 : 632.96

Ein Beitrag zur Anwendung des Antagonismus als biologische Bekämpfungsmethode unter besonderer Berücksichtigung der Gattungen *Trichoderma* und *Phytophthora* und Weitere Studien zur Anwendung des Antagonismus als praktische Bekämpfungsmethode des Keimlingssterbens der Tomaten.  
(The use of other fungi to control dying off in tomato and other seedlings.)  
[Italian summary.]

*Boll. Staz. Pat. veg. Roma*, 1938, 18 : 195-217, 367-82, bibl. 5.

The author shows how the inoculation of soil with *Trichoderma Koningi* and *Phytophthora parasitica* resulted in a great diminution of loss in the seed bed of tomato seedlings due to dying off caused by the second fungus. This indicates a possible new method of disease control. Numerous printing errors are corrected in an *erratum* page.

1303. SHUTAK, V. G., AND CHRISTOPHER, E. P. 635.64 : 632.951

**The influence of bordeaux spray on the growth and yield of tomato plants.**

*Proc. Amer. Soc. hort. Sci. for 1933*, 1939, 36 : 747-9, bibl. 4, *Contr. R.I. Exp. Stat.* 545.

Bordeaux sprays appear to retard ripening of outdoor tomatoes but may control disease sufficiently to show increased yields during some seasons. It was conclusively shown that high-lime bordeaux should be avoided and that, contrary to general belief, high-copper bordeaux may be safely used.

\* See also *H.A.*, 9 : 155.

1304. HUELSEN, W. A. 635.64  
**Problems in growing tomatoes in Illinois.**  
*Circ. Ill. agric. Exp. Stat.* **491**, 1939, pp. 48, bibl. 23.

1305. KHOLODNYUK, I. K., AND KHOLODNYUK, M. S. 635.655 : 581.13 : 632.951  
**Effect of sodium fluosilicate on photosynthesis in the soya bean.** [Russian, English summary 12 lines.]  
*Plant Protection, Leningrad*, 1939, No. 17, pp. 89-96, bibl. 17.

A study was made in Leningrad of the effect of sodium fluosilicate on the photosynthetic activity of injured and uninjured soya bean plants (Manchurian variety) grown in soil under hothouse conditions. From the day of planting to the end of the experiments the plants were given 8 hours of daylight, except for the last 24 hours when they were isolated from the light in dark boxes. Artificial injuries were made on the plants by means of a steel needle. The lesions constituted about 2.5% of the total leaf surface area. Treatment with sodium fluosilicate was found to result in a fall of photosynthetic activity of the injured plants for the first few days after dusting, but a rise of photosynthetic energy in uninjured plants.

1306. KINCAID, R. R., AND TISDALE, W. B. 633.71-2.411.4  
**Downy mildew (blue mold) of tobacco.**  
*Bull. Fla agric. Exp. Stat.* **330**, 1939, pp. 28, bibl. 15.  
 ANON.  
**Blue mold (downy mildew) of tobacco and its control.**  
*Bull. Va agric. Exp. Stat.* **318**, 1938, pp. 18.

A detailed account is given in the first bulletin of downy mildew with descriptions of the causal fungus, *Peronospora tabacina* Adam, of certain factors known to influence its severity, and of control measures, especially those that may be practical for use under Florida conditions. The latest experiments include breeding for resistance. The second bulletin is essentially practical in its aims, giving all the information that the Virginian grower should need to combat the diseases.

1307. SALMON, E. S. 633.79  
**Twenty-second report on the trial of new varieties of hops. 1938.**  
 East Malling Research Station, Kent, 1939, pp. 18, 6d.

New varieties bred at Wye College include several that crop at the rate of over 20 cwt. to the acre. The number of bushels of green hops giving 1 cwt. of dried hops varies from 84 to 152. Several of the new varieties are extremely rich in preservative qualities, excelling in this respect the best old varieties including American hops. It is pointed out that an additional hop acreage in this country of some 3,000 acres would produce a crop capable of replacing imported Americans. Notes are given on the incidence of mosaic disease, downy mildew and *Verticillium* wilt.

1308. HARLAN, J. D. 633.79  
**A trial of new varieties of hops for New York.**  
*Bull. N.Y. St. agric. Exp. Stat.* **687**, 1939, pp. 8.

The new hop varieties, Brewer's Gold and Bullion (raised by Salmon at Wye, England) grown in the vicinity of Waterville, New York, contained greater percentages of soft resins than any of the standard American hops. Brewer's Gold gave a much higher yield than any other variety. Doubt is expressed whether the variety Bullion will become as popular with the brewers as Brewer's Gold, which is well liked for its flavour.



1309. PIETSCH, A. 633.81/8  
Photographische Darstellung von Samen und Früchten wichtiger angebauter Heil-, Duft- und Gewürzpflanzen. (**The photographic reproduction of the seeds and fruits of some important cultivated medicinal, aromatic and spice plants.**)

*Ernähr. Pfl.*, 1939, **35** : 74-6, 139-42.

Plants considered are:—*Cnicus benedictus* L., *Satureia hortensis* L., *Sanguisorba minor* Scop., *Borago officinalis* L., *Origanum Majorana* L., *Melissa officinalis* L., *Hyssopus officinalis* L., *Salvia officinalis* L., *Thymus vulgaris* L., *Ruta graveolens* L., *Chrysanthemum cinerariaefolium* Trev., *Matricaria Chamomilla* L., *Anthemis nobilis* L., *Verbascum thapsiforme* Schrad., *Althaea rosea* L. var. *nigra*, *Pimpinella Anisum* L., *Anethum graveolens* L., *Foeniculum vulgare* L., *Coriandrum sativum* L., *Carum Carvi* L., *Brassica nigra* Koch, *Sinapis alba* L., *Aconitum Napellus* L., *Digitalis purpurea* L., *Datura Stramonium* L., and *Atropa Belladonna* L.

1310. SCHROPP, W., AND ARENZ, B. 546.27 : 633.85 + 633.5  
Über die Wirkung des Bors auf das Wachstum einiger Öl- und Gespinstpflanzen. (**The effect of boron on growth of certain oil and fibre plants.**)

*Forschungsdienst*, 1938, **6** : 564-74, bibl. 6.

In water culture experiments at Weihenstephan with *Brassica Napus oleifera*, *B. Rapa oleifera*, *Raphanus oleiferus*, *Camelina sativa*, *Linum usitatissimum*, *Cannabis sativa* and *Ricinus communis sanguineus*, boron was practically withheld from the nutrient solution. As a result growth was checked and flower and seed formation prevented. Healthy plant growth was only possible after 0.5 mg. boron had been added per litre nutrient solution.

1311. OPITZ, K. 633.52 : 635.13  
Versuche mit Lein als Überfrucht für Möhren. (**Flax and carrots grown together.**)

*Forschungsdienst*, 1939, **8** : 57-62.

Recent experiments at Tasdorf, Markau and Selchow on growing carrots with flax and oil seed poppy in association indicated that the practice cannot be recommended, at least under the conditions experienced at those three centres. It may be noted that the weather requirements of the different crops are different.

1312. PIEFER, H. 633.52 : 635.13  
Dreijährige Versuche über den kombinierten Anbau von Lein und Möhren. (**Trials on combined cultivation of flax and carrots.**)

*Forschungsdienst*, 1939, **8** : 63-9.

The results of the trials at Pillnitz, which are discussed here at some length, do not agree with those obtained by Opitz, *see* previous abstract. The Pillnitz trials lead to the following conclusions:—A combined cultivation of flax and carrots is recommended on account of (a) higher total returns than from single cultivation, and (b) smaller risk if the flax crop fails. In these experiments flax grown for fibre gave better returns than flax grown for oil. Flax crosses of the type Sorauer 35 were found to be particularly suitable for combined cultivation with carrots. Oil poppies grown alone gave a better oil return than linseed, but are less suitable for growing together with carrots. Planting should consist of 2 rows of flax followed by 1 of carrots. This should ensure a good yield of carrots and, if not a very good, at least a reasonable crop of flax.

1313. OPITZ, K. 633.52  
Vergleichende Untersuchungen zur Beurteilung der Güte der Fasern im Leinstengel. (**Flax fibre examinations.**)

*Forschungsdienst*, 1939, **7** : 58-86.

Investigations in Germany by Opitz and fellow workers showed that the morphological and microscopic anatomical examination of flax straw is an appropriate method for determining the quality of the long-fibres and their suitability for technical uses.

## FLOWER GROWING.

1314. BARTON, L. V. 635.9 : 631.531  
**Storage of some flower seeds.**

*Contr. Boyce Thompson Inst.*, 1939, 10 : 399-427, bibl. 27.

The keeping quality of the flower seeds tested is shown to depend upon storage conditions and not upon original vitality. In all cases a combination of high moisture content and a temperature of 5° C. brought about deterioration at about the same rate as a lower moisture content and room temperature. Under conditions of high humidity the seed could only be kept viable when the temperature was below freezing. There is a discussion of some of the factors involved in the retention of vitality.

1315. ORCHARD, O. B. 577.15.04 : 635.936.69  
**The use of plant hormones in the propagation of carnations.**

*Twenty-fourth A.R. exp. Res. Stat. Cheshunt 1938*, 1939, pp. 97-9.

98% of carnation cuttings rooted when treated with one of two proprietary plant growth substances and set in either sand or sand and loam against 78% in sand and 33% in sand and loam of untreated cuttings. The instructions of the makers as to dilution strength were followed closely. Experiments are continuing to discover whether reported failures elsewhere may be due to failure to follow the makers' directions.

1316. BRANDON, D. 631.535 : 635.937.34 : 581.192  
**Seasonal variations of starch content of the genus *Rosa* and their relation to propagation by stem cuttings.**

*J. Pomol.*, 1939, 17 : 233-53, bibl. 18.

A series of experiments to ascertain the rooting capacities of various species and varieties of *Rosa* carried out at Reading University is described. The highest percentage of rooting with hardwood cuttings was obtained from those inserted during the period October to December and with softwood cuttings in June. None of various chemical treatments appreciably increased the rooting percentage though some depressed it. Two pH values, namely 5 and 7, in the solutions had no effect on rooting. The starch fluctuation was studied and found to vary with the species or variety and to be a genetically related phenomenon. Roughly, roses can be divided into those which lose their starch in winter and those which do not. Starch content of the cuttings bears no relation to ease of rooting. Starch accumulation in the spring is delayed by pruning, which also delays growth by about a month.

1317. WETZEL, A. 631.416.7 : 635.937.34 : 581.14  
**Das Kalk-Kali-Gesetz als Erklärung für Wachstumsstockungen bei Treib- und Freilandrosen. (The lime-potash law as affecting the growth of roses.)**  
*Ernähr. Pfl.*, 1939, 35 : 72-4.

An account is given of rose trials near Brandenburg and at other places in northern Germany. Roses usually grow rather well on soils containing lime. However, this does not hold good for all rose varieties. In order to secure a regular and healthy growth of roses on soils containing fairly large amounts of lime they should be adequately provided with easily available potash and phosphoric acid. Roses grown in the open air should be given 6 to 8 kg. of sulphate of potash magnesia and 4 to 5 kg. of basic slag per ha.

1318. BECKER, J., AND WETZEL, A. 631.811.3 : 635.944  
**Die Wirkung des Nährstoffs Kali auf das Wachstum der Gladiolen. (The effect of potash on the growth of gladiolus.)**  
*Ernähr. Pfl.*, 1939, 35 : 204-8.

The results of trials carried on for two years at Vetschau led to the following conclusions :—Inadequate manuring unfavourably affects the quality and yields of gladiolus corms. Balanced manuring and particularly potash manuring results in an increase of the yields of cormels, in improved quality of corms and in a greater readiness of the corms to flower.

1319. HARGRAVE, J., AND THOMPSON, F. C. 635.944 : 581.192  
**The influence of size on the dry matter, mineral and nitrogen content of hyacinth bulbs.**

*J. Pomol.*, 1939, 17 : 185-94, bibl. 13.

An investigation of the dry matter, mineral and nitrogen content of hyacinth bulbs ranging in size from 6 to 16 cm. at the Agricultural Institute, Kirton, England, is described. It is concluded that size alone has a definite influence upon chemical composition. Potash, phosphoric acid and nitrogen percentages all show a fall from sizes 6-8 cm. (nitrogen fall not significant) and a progressive rise from 8 to 16 cm. The 6, 8 and 10 cm. sizes were all significantly higher in dry matter than the 12, 14 and 16 cm. sizes.

1320. BOULD, C. 635.944 : 631.8  
**Studies on the nutrition of tulips and narcissi.**

*J. Pomol.*, 1939, 17 : 254-74, bibl. 13.

The investigations carried out at Reading University from 1934 to 1937 concerned the effect of nutritional deficiencies on the growth, flowering and bulb weight increase of narcissi and tulips and on the chemical composition of the bulbs. Omission of nitrogen produced typical deficiency symptoms in foliage and a significant reduction in bulb weight increase. Omission of potassium reduced bulb weight increase but did not produce leaf scorch or affect flower quality. The omission of phosphorus caused a considerable reduction in bulb weight increase of tulips during the second season. There were marked changes in the inorganic and nitrogen content of the bulbs during the first year but no significant change in the carbohydrate content. The analyses of dormant bulbs for total nitrogen, phosphorus and potassium, it is suggested, might give some indication of their probable performance during the next growing season.

1321. BEAUMONT, A., AND BUDDIN, W. 635.944 : 632.48  
**Notes on *Fusarium avenaceum* attacking the leaves of tulips in glass-houses.**

Reprinted from *Trans. Brit. mycol. Soc.*, 1938, 22 : 113-5, bibl. 5.

Other species of *Fusarium* have been found on tulips, especially on bulbs, but *Fusarium avenaceum* is the more common species occurring on the foliage. Owing to its wide range of hosts the fungus is likely to be present in most nurseries. Control measures consist of the use of clean straw for covering the boxes out of doors and the correct regulation of temperature (not over 70° F.) and humidity (not over 80%) during forcing operations.

1322. SEALE HAYNE, DEPARTMENT OF PLANT PATHOLOGY.\* 635.944 : 632.6/7  
**The use of chemicals in the hot (water) treatment of narcissus bulbs.**  
*Fifteenth A.R. Seale Hayne agric. Coll., Dep. Plant Path., for year ending 30 Sept., 1938, 1939, pp. 22-8.*

Fungi which cause bulb rot after hot water treatment are *Trichoderma viride* and *Fusarium* spp. Tests of the addition of various chemicals to the water show that these may not entirely prevent subsequent bulb rot, although they actually prevent infection during the treatment. Formalin at 1 quart per 100 gallons water did no harm to the growth of most narcissus bulbs over a wide range of dates of treatment. Iodine 1 in 8,000 did no harm to bulbs and was more effective than formalin against eelworm. Methyl mercury chloride and methyl mercury nitrate prevented the growth of bulbs in a few cases.

1323. THORNTON, N. C. 635.935.722  
**Development of dormancy in lily bulbs.**

*Contr. Boyce Thompson Inst.*, 1939, 10 : 381-8, bibl. 2.

Bulbs of *Lilium longiflorum* Thunb. stored in soil under conditions limiting aeration, e.g. soil with fine rather than coarse particles, develop partial dormancy and fail to grow satisfactorily when planted. Bulbs stored under conditions providing for aeration showed no dormancy.

\* Advisory Entomologist, L. N. Staniland. Advisory Mycologist, A. Beaumont.



The investigation described dealt with aeration from the standpoint of oxygen supply, but the presence of carbon dioxide may have had some influence on the results and further investigations on this point will be made.

1324. GIGANTE, R. 635.944 : 632.8  
 La variegatura del tulipano. (**Breaking in tulips.**)  
*Boll. Staz. Pat. veg. Roma.*, 1938, 18 : 429-54, bibl. 24.

#### CITRUS AND SUB-TROPICALS.

1325. CALVINO, M. 634.1/8 : 551.566.1  
 Frutti tropicali e subtropicali nel mondo. (**Tropical and sub-tropical fruit growing**) being General Report 12th International Horticultural Congress, Berlin, August 1938, Section 6.  
*Pubbl. Staz. sper. Floricoltura O. Raimondo, Sanremo*, 30, 1938, pp. 11-20.

All too brief notes are given on citrus, banana, pineapple, avocado and mango and even shorter ones on date palm, papaw, passion fruit, fig, fruits belonging to the *Annonaceae*, *Sapotaceae* and *Myrtaceae* with a reference to the loquat. Bound up with this article is a paper by the same author on tropical and sub-tropical fruit trees in Italy.

1326. ARNDT, F. R. 634.3  
**The culture of citrus fruits in South Australia.**  
*J. Dep. Agric. S. Aust.*, 1938, 42 : 476-85, 781-90.

The cultivation of citrus in South Australia is described. The chief varieties grown are—*Orange*. Washington Navel, Thompson's Improved Navel, certain old seeded varieties collectively called "commons", Valentia Late and Valentia Late Improved. The latter, a great improvement in every way on Valentia Late, first appeared in 1911, but little is known of its history. *Mandarin*. Dancy's, Beauty of Glen Retreat and Emperor. *Grapefruit*. Marsh's Seedless. *Poorman*. This somewhat resembles a grapefruit but is coarser and has differently flavoured juice. Used chiefly for marmalade. *Lemon*. Lisbon. The stocks in common use are sour orange, sweet orange, considered the best general purpose stock, and rough lemon, here called citronelle.

1327. SOUTH AFRICA, UNION OF. 634.3 : 382.6  
**Fruit production in the Union. Report No. 24 : the 1938 citrus export season.**  
*Bull. Dep. Agric. S. Afr.* 200 (Plant Industry Series 47), 1939, pp. 72.

Statistical data are here given of citrus fruit exports from Transvaal, Natal and Cape Province for the 1938 season. The text, which is written in English and Afrikaans, includes extracts from recent citrus export regulations.

1328. BRAVERMAN, J. S. 634.3  
**A possible outlet for citrus fruit in Palestine in case of war.**  
*Hadar*, 1939, 12 : 99.

A scheme by the author for the utilization of Palestine citrus fruit in time of war is here summarized by the editors of *Hadar*. The suggestions are :—(1) to ferment the juice and distil from it either alcohol or acetone, since both products are used in the manufacture of explosives, (2) to mince and dry the pulp for fodder ; citrus so prepared is said to form a complete substitute for barley. [These proposals are criticized by a correspondent and the criticisms answered by the author in *Hadar*, 1939, 12 : 175-7, 184.]

1329. BRAVI, S. 634.3 : 382.6  
**Restriction of exports.**  
*Hadar*, 1939, 12 : 103-5.

Over-production of citrus is becoming a problem in Palestine as elsewhere. Many proposals for controlling export would press unfairly on one or another section of the growers. A method is suggested which the author considers would be fair to all. Briefly, it is that every shipper of packed fruit should present simultaneously at the same point a quantity of unpacked fruit

equalling 25% of the packed fruit. Thus 25% would be destroyed, sold for home consumption, or processed by the government. Since the grower would be able to select the unpacked fruit himself it is obvious that he would include only those of inferior grade from whatever cause. Thus the export pack itself would benefit from the absence of inferior fruits. The allocation of funds received by the government from the sale of these rejects would be a matter for discussion, but in any case the cost of assembling and transporting should be returned to the grower. The author discusses a number of the problems which might arise in operating his plan.

1330. ANAGNOSTOPOULOS, P. T. 634.33

**The decline of citron growing in Crete and proposals for preventing it.** [Greek, English summary 23 l.]

*Hort. Res., Athens*, 4 : 99-112.

The recent decline in the growing of citron (*Citrus medica*) in Crete has been examined and is reported on here by the author. The cause of the decline would appear to be extreme lack of knowledge or care in cultivation methods. The weakened trees thus become an easy prey to pests and parasites.

1331. TORRES, J. P. 634.3-1.523

**Progress report on citrus hybridization : propagation.**

*Philipp. J. Agric.*, 1939, 10 : 95-119, bibl. 8.

The paper presents some methods of raising citrus hybrid seedlings and budded plants. Only ideas which appear to be new are mentioned in this abstract and usual cultural care must be taken for granted. Selected hybrid seedlings are pricked out in beds or boxes, spacing 8-10 cm., when 3-5 months old and the most vigorous are removed to nursery rows when 40-50 cm. high. If sloping ground has to be used for the nursery beds it will probably be of a hard clayey nature, hence, to prevent wilting in dry weather, a shallow furrow is dug round each seedling to allow of the penetration of water. Seedlings appearing to lag in their growth in the nursery rows are manured a few months before transplanting. A total per plant of 7-10 grams of nitrogenous fertilizer is inserted into 3 or 4 small holes made round each seedling to the depth of the root system, the ground having been previously well watered. The vigorous shoots then produced are hardened off before transplanting. Weakly hybrids with poor root systems are budded for trial purposes as are those which it is required to increase. The less vigorous stocks are treated manurially as already described and five weeks later are vigorous enough to bud. Over-large stocks with tough bark are rendered suitable by earthing up the previously watered soil round them to a height of 6-8 inches. In 30-40 days the treated bark readily lifts for budding. In cutting the bud for shield budding the author prefers for a number of reasons to cut the bud from the distal end towards the butt end instead of the reverse way as is usual ; he considers, for instance, the upper portion of the shield to be the more important end and that by thus receiving the first cut its proper length and thickness can be easily determined. The fruiting of hybrids is greatly hastened by budding them on the water shoot or side shoots of large trees. Suitable shoots should be about 50 cm. high with the lower portion beginning to harden. Suckers springing from the roots are to be preferred for this work. To provide young weakly seedling hybrids with a double root system tongue inarching was tried. (The technique is described in abstract 1374.) The seedling stock and scion both about  $\frac{1}{2}$ - $\frac{3}{4}$  pencil diameter were removed from the ground, inarched and then potted, both sets of roots of course being in the same pot. The top of the seedling stock was removed after union was complete. As regards the most suitable size for transplanting the losses among the larger trees, 120 cm. in height, were very much less than those of the small sized plants about 60 cm. high.

1332. GUSTAFSON, F. G. 577.15.04 : 581.163

**The cause of natural parthenocarp.**

*Amer. J. Bot.*, 1939, 26 : 135-8, bibl. 11.

It has been shown that the auxin content in the ovaries of flower buds from varieties of oranges, lemons and grapes that produce fruits parthenocarpically is higher than in the ovaries from corresponding varieties that do not produce fruits parthenocarpically. [Author's summary.]

1333. RUGGIERI, G. 634.334 : 575.252  
 Mutazioni vegetative su piante di limone ed opportunità della selezione  
 gemmaria in agrumicoltura. (**Lemon bud sports and bud selection in citrus.**)  
*Boll. Staz. Pat. veg. Roma*, 1938, **18** : 331-41, bibl. 8.

The author describes his observations on a branch mutation in a lemon tree. By budding with material from this branch he showed that the phenomenon was due to bud mutation. He compares it with similar phenomena noted by Savastano, Reinking, Shamel and others and utters a plea for the careful watching of all citrus trees, in order that sub-normal bud mutations may be rapidly eliminated by removal and rebudding, and may not be used for normal propagation, that only wood from entirely normal trees be used for propagation, and that in cases where the growth of a bud mutation gives indication of its superiority to normal growth, the mutation should be propagated and tested thoroughly before being used on a large scale.

1334. JOACHIM, A. W. R. 634.3-1.4 + 1.8  
**Some soil and manurial problems of citrus culture in Ceylon.**  
*Trop. Agriculturist*, 1939, **92** : 216-19.

An acre of citrus giving average yields removes from the soil per annum about 55 lb. nitrogen, 12 lb. phosphoric acid, 45 lb. potash, 85 lb. lime, thus citrus grown commercially requires to be fairly heavily manured and limed. An adequate supply of soil organic matter is also a necessity. Periodical liming of citrus plantations is necessary since citrus trees absorb large quantities of calcium, in fact calcium constitutes about one-third of the ash of healthy citrus trees. Lime deficiency is shown by chlorosis but chlorosis may also result from a number of other deficiencies and causes. For soils of average fertility beneficial results have been obtained from a fertilizer consisting of 3 parts sulphate of ammonia or nitrate of soda, 2-3 parts superphosphate or basic slag, 1 part sulphate of potash, applied annually a month before flowering at the rate of 4-10 lb. per bearing tree according to age and a month after fruit set another 1 or 2 lb. of sulphate of ammonia or nitrate of soda per tree. It is best applied dissolved in the irrigation water.

1335. BENTON, R. J. 634.3-1.8  
**Manuring citrus trees.**  
*Agric. Gaz. N.S.W.*, 1939, **50** : 377-8.

Lemon, grapefruit and orange require the greatest amounts of plant food, especially lemons in localities favourable to continuous cropping. Nitrogen is especially necessary and in a quickly available form. Mandarins require less nitrogen, about one-third the quantity applied to oranges, or an excessive number of fruits of small size will be produced which will have to be minimized by severe pruning; severe pruning, however, in the coastal districts of N.S.W., renders the trees susceptible to brown spot disease.

1336. HAAS, A. R. C. 631.415 : 634.3 + 634.51  
**Growth of citrus and walnut trees are affected by pH.**  
*Calif. Citrogr.*, 1939, **24** : 351, 364, 379, 388, 406-8, 430, 458, bibl. 5.

A number of pot and soil culture experiments with citrus and walnut to determine the most suitable range of pH are described. Citrus and walnut trees, though tolerant over a fairly wide range of pH, made their best growth in acid rather than alkaline solutions or soils, and at a degree of acidity far greater than is commonly believed. To faulty methods of preparing samples for pH determination is attributed the common idea that these trees grow equally well over wide ranges of pH. The pH value in soils depends partly on the soil moisture content at the time of pH determination.

1337. ESSELEN, D. J., AND OBERHOLZER, P. C. J. 634.31 : 581.192 : 631.85  
**Reduction of acid in Valencias.**  
*Fmg S. Afr.*, 1939, **14** : 21-2.

A preliminary report on the reduction of acid in S. African oranges by means of superphosphate sprays. In experiments made in 1937 and 1938 the spraying not only reduced the acid content



of the fruit of that season but seems to have had a hold-over effect on the fruit of the following year. Recommendations are:—Spray the trees in January (in S. Africa) with a solution of  $\frac{1}{2}$  lb. 19-1% superphosphate to 1 gallon of water plus a sticker. If no washing facilities are available, only clear supernatant solution should be used. The recommendations are succeeded by a series of warnings against taking anything for granted in the present experimental stage of the method. The experimental work has been carried out at the Nelspruit Horticultural Research Station.

1338. BADACHKORIA, P. G., AND PAPISOV, P. I. 634.322  
**Tasting the mandarins grown in Colchis.** [Russian, English summary 7 lines.]  
*Soviet Subtropics*, 1939, No. 9 (61), pp. 48-50.

The fruits of several varieties of young mandarins grown in two Colchis localities were submitted to tasting trials by the Ryndin method\* and classified accordingly. The fruits of mandarin varieties grown in the Korati district (on a heavy alluvial soil) were of better quality than the same grown in the Poti district (sandy soil).

1339. LE ROUX, J. C. 634.3-1.541.44  
**Top-working citrus trees.**  
*Fmg S. Afr.*, 1939, 14 : 173-5.

A description is given of a method of topworking citrus by T shield budding direct on to, say, 3 central main branches of citrus trees and not, as is usual, on to the shoots arising from cut back branches. Buds are inserted in opposite pairs on the selected branches and some weeks later, when the weather is reasonably cool, the budded branches are cut back close to the bud, the lower horizontal branches of the tree being left intact for a further year. Based on results obtained from 3,000 citrus trees of various well-known kinds the advantages over the old method are (1) a gain in time because there is no interval while the secondary shoots develop, (2) small crop losses since the budding is done in autumn while the crop is still on and the first cutting back in spring after the harvest has been gathered. In all only  $1\frac{1}{2}$  crops are lost before the new variety begins to bear a good crop. The results are superior to and cheaper than replanting with young trees.

1340. WALKER, S. J., AND SAMUELS, C. D. 634.31-1.57-1.8  
**Disposal of orange waste as fertilizer.**  
*Calif. Citrogr.*, 1939, 24 : 350.

A vast quantity of orange waste is disposed of unprofitably each year. It is suggested that this should be returned to the land as fertilizer. In this paper from workers at the Agricultural Laboratory, Anaheim, California, it is demonstrated that citrus waste is of equal value in all respects to a standard product known as dairy manure except during spring when an additional 50 lb. of actual nitrogen per acre should be spread over the waste. Pulp and peel have similar reactions on the soil. The heavy use of orange waste on very sandy soils has increased their retentiveness of water by 20-30%. Application should be 300-500 lb. per tree. To prepare the waste for the soil it is best to shred it by a mechanical shredder, this reduces its volume by 49% and the pulp absorbs 95% of the juice. The mechanical details involved in the use of this equipment, known as the Sander-Backs shredder, are being worked out by the Mutual Orange Association, Placentia, Calif.

1341. CAMP, A. F., AND FUDGE, B. R. 634.3-2.19  
**Some symptoms of citrus malnutrition in Florida.**  
*Bull. Fla agric. Exp. Stat.* 335, 1939, pp. 55, bibl. 196.

The common symptoms of malnutrition of citrus in Florida caused by deficiencies of copper, zinc, manganese, magnesium, nitrogen, iron, boron, or by excess of boron, are illustrated in colour and discussed in detail. The symptoms are considered according to whether they appear

\* See Soviet Subtropics, 1938, No. 2.

in leaves, twigs, or fruit, and whether and how they are modified in the presence of particular environmental conditions. Varietal susceptibility is noted and the practical causes and treatment are dealt with in all cases. Among terms used to describe different phases of particular deficiency symptoms are the following :—copper :—dieback, ammoniation, exanthema ; zinc :—frenching, mottle-leaf, foliocllosis ; manganese :—marl frenching, marl chlorosis ; magnesium :—bronzing or copper leaf ; nitrogen :—inverted frenching, vein chlorosis ; iron :—iron chlorosis ; boron deficiency :—hard fruit. The comprehensive bibliography should be noted.

1342. FUDGE, B. R. 634.323-1.811.6 : 581.145.2  
**Relation of magnesium deficiency in grapefruit leaves to yield and chemical composition of fruit.**

*Bull. Fla agric. Exp. Stat.* **331**, 1939, pp. 36, bibl. 16.

In Florida the main difference between the seedy grapefruit varieties, Duncan, Excelsior and Walters, and Marsh Seedless was a greater production of seed and the clustering of fruit in the former. Seedy fruit contained more N and minerals than Marsh. Crop production caused a significant reduction in N, P, Ca, Mg and Mn of leaves in the vicinity of the fruit. This was more marked in the seedy varieties. Of the elements the reduction of Mg was the most noticeable. A low supply of available Mg combined with its removal in crop production resulted in bronzing and consequent loss of foliage in seedy varieties. The poor physical condition of trees of seedy varieties after the production of heavy crops caused the alternation of bearing habit. The loss of Mg from Marsh trees was smaller and no bronzing of the leaves occurred. Since the extreme alternation of bearing found in individual trees of seedy varieties did not occur in Marsh trees, it is thought that the actual removal of Mg is secondary to the physiological effect of bronzing and subsequent loss of foliage in causing alternate bearing. It is concluded that applications of Mg with the fertilizer will prevent bronzing and thereby reduce alternate bearing to a minimum.

1343. JOHNSTON, J. C. 632.111 : 634.3  
**The use of blowers for frost protection.**  
*Calif. Citrogr.*, 1939, **24** : 354, 370-1.

An examination of the effect of wind machines in Tulare County, California, as a means of protection of citrus groves against frost leads to the conclusion that with a ceiling of warm air and a temperature not too low, such as in spring and early autumn frosts, they may be effective. On the other hand orchard heaters which are capable of dealing with almost any probable degree of frost can be installed at less expense.

1344. SCHOONOVER, W. R., BROOKS, F. A., AND WALKER, H. B. 632.111 : 634.3  
**Protection of orchards against frost.\***  
*Calif. Citrogr.*, 1939, **24** : 428, 457, 459.

In California 92,000 acres, or one-third of the entire citrus area, is equipped with orchard heaters. In the frost of 5-27 January, 1937, these heaters burnt 3% of the entire United States annual refinery output for this grade of fuel. The cost of installing satisfactory equipment is 175 dollars per acre for oranges and 280 dollars for lemons. The freezing point of oranges is 28·5°-29·5° F. for the juice of green oranges, 27°-28° F. for ripe oranges and grapefruit. The suggestions issued by the U.S. weather bureau as to the atmospheric conditions in which it is advisable to light heaters are quoted. In computing the number of heaters necessary the basic principle is a large number of small fires per acre, from 60 to 80 being mentioned. In districts where heating is general over a wide area there is a marked effect on temperatures over the entire area so that the amount of equipment required can be reduced by 10-20%. The remainder of the paper is taken up with detailed instructions for the lighting, management and care of heaters.

\* Being excerpts from *Bull. Univ. Calif.*, 111.

- 1345: LAVRYICHUK, I. I. 634.334-2.111  
**Low trained lemon trees.** [Russian.]  
*Soviet Subtropics*, 1939, No. 10 (62), pp. 23-30.

A special method for training lemon trees in the humid subtropics is here described. It consists essentially of circular, horizontal training at 25 cm. of stem and all branches and is said to have the following advantages:—Plants trained in this manner become more drought-resistant and less susceptible to frost injury. The trees bear more regularly and can be sheltered from winds more easily.

1346. NIKIFOROV, V. P. 634.3-2.111  
**The latest in frost protection of citrus.** [Russian, English summary 22 lines.]  
*Soviet Subtropics*, 1939, No. 10 (62), pp. 17-22.

In experiments at Sukhum truncated pyramidal tents for individual frost protection of lemon trees proved to be superior to the ordinary pyramidal tent type. The main advantages were:—economy of the heating costs inside the tent and higher and more even temperatures. A new heater which was found to be extremely economical is described. The heat distributing pipe of the heater may be used to intensify the heating capacity of ordinary heaters.

1347. NADARAYA, G. B. 634.34-2.11  
**Frost protection for lemons.** [Russian, English summary 17 lines.]  
*Soviet Subtropics*, 1939, No. 10 (62), pp. 10-16.

Under humid subtropics conditions individual tree tents of three-layer cheese cloth provided a very effective protection of lemon trees against frost injury. Heating was found to be unnecessary when temperatures did not fall below  $-8^{\circ}\text{C}$ .

1348. MULLER, H. R. A. 634.3-2.3/4  
 Overzicht van de belangrijkste citrusziekten in Nederlandsch Indië. (**The principal citrus diseases of the Dutch East Indies.**) [English summary 3 pp.]  
*Landbouw*, 1939, 15: 249-90, bibl. 1; also issued as *Meded. algem. Proefst.*  
*Landb.* 34 and *Meded. Inst. PlZiekt.* 94.

Most of the diseases have been already described by Fawcett\* so that only new data provided by the author are here summarized. *Rhizoctonia* damping off was controlled by weekly spraying of the seed beds with 1.5% bordeaux mixture. Soil treatments with 0.02% Ceresan and 0.05% Terbolan solutions were effective. *Armillaria* and *Rosellinia* root rots were effectively controlled by cutting away the diseased roots and treating the remainder with 1.5-3 kg. of sulphurous volcanic ashes containing 60-70% free sulphur. The same amount of sulphur ashes is mixed with the soil before replacing it. Bark disease caused by *Diplodia natalensis* took two forms, (1) excessive gumming followed by the scaling of large patches of bark down to the cambium, which is killed, and by the girdling of the whole tree or main branches; (2) the bark dries up and small cracks appear from which protrude the white and black spore masses of the fungus. This dry form generally occurs on trees heavily damaged by *Aster olecanium* scale. Treatment in both forms consists in cutting out diseased bark and treating the wounds with 8% carbolineum plantarium mixed with 92% hard paraffin wax. Two other bark rots are described, wither tip and anthracnose, the causal fungus in each case being *Colletotrichum gloeosporioides*. They are prevalent in certain years and trees suffering from lack of phosphorus seem more susceptible. Powdery mildew (*Oidium tingitaninum* Carter) is prevalent and more or less successfully treated by sulphur dusting in the hotter districts and spraying with home-boiled lime-sulphur in the cooler, or by spraying with 1% Solbar or Mil-Du-Spra solutions but not with bordeaux. *Fruit rot*. *Inspissosis* (*Nematospora Coryli* Peg.), a widely distributed disease which causes internal drying of the fruit without any external symptom whatever, has been found to be carried by *Rhynchocorus* and other plant bugs. The bugs once they have

\* Fawcett, H. S., *Citrus diseases and their control*. 2nd edit. McGraw-Hill Book Co., London, New York.



become infective appear to remain so all their lives and through all successive instars of the larvae. Another fruit rot (*Oospora Citri-aurantii* Ferr.) is transmitted by borer moths (*Ophideres fullonica* L.).

1349. RANGEL, J. F., AND GOMES, J. G. 634.31-2.3/4 + 2.6/7  
 Guia para reconhecimento e combate das principais doenças da laranjeira.  
 (A guide to the identification and control of the chief diseases and pests of  
 the orange.)  
*Publ. Minist. Agric. Serviço de Defesa sanit. veg. Brazil* **11**, 1938, pp. 78,  
 bibl. 16.

The diseases and pests dealt with are those more or less common to all orange growing countries. In order to make identification easy they are classified first by the parts of the tree attacked, second by the type of injury, and in the case of insects a description of the creature involved is also given; the name follows in Latin and Portuguese and then control measures are given and the number of the formula as described in the appendix. Identification is assisted further by the coloured plates and other illustrations.

1350. KLEIN, H. Z. 634.3-2.654.2  
 On the ecology of the citrus red spiders in Palestine.  
 Reprinted from *Bull. ent. Res.*, 1938, **29** : 37-40.

Two species of red spider (*Anychus orientalis* Zacher and *Epitetranynchus althaeae* Hanst.) found in Palestine were studied. The study was based on ecological data, breeding and activity trials. The reason for the different distribution of the two species throughout the world is explained, the Oriental red spider species being a subtropical and the common red spider a cosmopolitan element.

1351. SCHULTZ, E. F. 632.752 : 634.31  
 Una nueva plaga en los naranjales tucumanos : la "Cochinilla del Delta."  
 (*Mesolecanium deltae*, Lizer.) (Delta scale, a pest new to Tucuman orange  
 groves.)  
*Circ. Estac. exp. agric. Tucuman* **66**, 1938, pp. 7.

The citrus scale, *Mesolecanium deltae*, Lizer, is here reported for the first time from Tucuman. Its specific name alludes to the Delta of the Parana where it is common in the island citrus groves. It is described and illustrated and growers are warned to look out for its appearance in their plantations. Control measures are suggested and the urgency of discovering the local foci of infection is stressed.

1352. BEN-AMOTZ, Y. 634.3-2.752  
 Experiments with oil spray for the control of the mussel scale (*Lepidosaphes  
 pinnaeformis* Behé.)  
*Hadar*, 1939, **12** : 203-6, bibl. 3.

Experiments in the control of mussel scale of citrus by spraying have resulted in good control by the use of 1½% and 2% Shell white oil spray emulsion, containing 80% medium grade oil, applied in August or a light medium grade oil in September when the trees appear to become more sensitive to spray damage.

1353. BARTHOLOMEW, E. T., SINCLAIR, W. B., AND JANES, B. E. 632.944 : 634.3  
 Factors affecting the recovery of hydrocyanic acid from fumigated citrus tissues.  
*Hilgardia*, 1939, **12** : 473-95, bibl. 10.

Methods are described for the handling of HCN in amounts as small as 10-15 mg. and for the distillation, recovery and determination of HCN from citrus tissues.

1354. MARLOTH, R. H., AND STOFBERG, F. J. 634.31-2.951

**Effect of arsenic and copper sprays on navel oranges.**

*Fmg S. Afr.*, 1939, 14 : 180-1.

The report deals with the results obtained over a 4-year period in regard to the effect of sprays containing lead arsenate and copper carbonate on the quality of Washington Navel orange fruits. Lead arsenate at the rate of 1 oz. of lead arsenate per large tree, applied as a spot spray, slightly increased the soluble solids : acid ratio in the juice, and markedly reduced the acid when used as a cover spray carrying 5 oz. per tree. The effect of the acid reduction was more marked on the crop in the year following the application than on the current crop. There was no apparent effect of lead arsenate on the total soluble solids in the fruit juice. There was no effect on total soluble solids or acid content of juice of subjecting the fruit to 5 cover sprays of copper carbonate at the rate of 5 oz. per large tree. The fruit coloured slightly earlier. The quantity of arsenic present in the fruit juice following cover spraying with lead arsenate was negligible and there was no increase in the lead or copper content above normal as a result of the lead arsenate and copper carbonate sprays.

1355. BOYCE, A. M., PRENDERGAST, D. T., KAGY, J. F., AND HANSEN, J. W. 632.654 : 634.3 + 634.51

**Dinitro-o-cyclohexylphenol in the control of mites on citrus and Persian walnuts.**

*J. econ. Ent.*, 1939, 32 : 450-67, bibl. 6.

Promising results were obtained.

1356. REIFENBERG, A. 631.8 : 631.4

**Manurial requirements of soils in Palestine.**

*Emp. J. exp. Agric.*, 1939, 7 : 221-4, bibl. 6.

The manurial requirements of the soils of Palestine are discussed. The need for organic manure is great. A low-moor peat found in the north of Palestine may prove a substitute for organic manure. Four tons per acre of this peat is sufficient to absorb all the nutrients added to the soil. A fertilizer balance sheet is given from which it appears that for 1935 the amount of nutrients removed from the soil by the principal crops exceeded the amount added in the form of fertilizers by the following amounts :—nitrogen 4,658 tons, phosphates 977 tons, potash 5,195 tons.

1357. BENJAMIN, M. S., AND OLD, A. N. 634.775.4 : 581.192 : 632.51

**Chemical composition of prickly pear.**

*Agric. Gaz. N.S.W.*, 1939, 50 : 240, 276.

In certain districts in New South Wales the cactoblastis insect has failed to control prickly pear. A resistant strain of prickly pear evidently exists ; it differs from the non-resistant pear by its relative dryness, high carbohydrate content and by being highly mucilaginous ; on sectioning the resistant pear will be found to be yellow-green merging to white in the centre as opposed to the uniform greenness of unattacked pears. A possible significant difference may be the richer potash content of the attacked plants, pH values of the cell sap appear to have no bearing on the problem of insect attack, nor could any correlation be found with the chemical composition of the 14 soil types on which the pears were growing. The potash content of the prickly pear is high but not so high as is often claimed. When used as an emergency feed for stock the pear must be supplemented by protein-rich foods.

1358. MOSSOP, M. C. 632.944

**Fumigation with hydrocyanic acid gas.**

*Rhod. agric. J.*, 1939, 36 : 220-35, 317-29.

A very complete practical guide on the construction of fumigation chambers, measurement of space, apparatus and manipulation thereof, on dosage, ventilation, and disposal of residue and on safety precautions including gas masks and first aid.

1359. MARSHALL, G. W. 634.1/8  
**The Rhodesian home orchard.**  
*Rhod. agric. J.*, 1938, **35** : 987-1001, and 1939, **36** : 139-61.

These useful hints on fruitgrowing in S. Rhodesia are intended primarily for the man who wants to grow fruit trees on his farm or in his town plot, but their appeal is certainly much wider. A climate in which one can apparently grow not only apples but also grapefruit and litchis deserves, one would think, a complete manual on fruitgrowing. Meantime these notes with general directions on choice of varieties, pruning, cultivation and spraying are welcome.

1360. ELMER, O. H. 633.492  
**Sweet potatoes in Kansas.**  
*Bull. Kans. agric. Exp. Stat.*, **278**, 1938, pp. 52, bibl. 9.

The essential points in the cultivation of sweet potatoes under Kansas conditions are here considered. They include notes on selection of planting stock, variations within sweet potatoes, hotbed construction and management, seed treatment, planting, care, harvesting, curing, storing and marketing. Sweet potato diseases and pests and their control are discussed.

1361. SIEGEMURA, T., TAKAHASI, T., AND KAKIHARA, K. 633.492 : 612.014.44  
**Sweet potato breeding by seeds with artificial induction of blooming.**  
 [Japanese with English summary.]  
*Proc. Crop Sci. Soc. Japan*, 1938, **10** : 281-96, abstract 7 lines *Jap. J. Bot.*, 1939, **10** (21).

The trials were made at an agricultural experiment station in Korea, where under natural conditions the sweet potato does not produce flowers. Flower formation was, however, induced by short day treatment at 8 or 10 hours per day.

1362. KAGAWA, F. 633.492 : 575.255  
**Chimeras in sweet potatoes.**  
*Jap. J. Bot.*, 1939, **10** : 43-54, bibl. 1.

A description of sweet potato chimeras showing the chimerical character in the roots.

1363. MASLENNIKOV, A. V. 633.85  
**Tung tree response to fertilizer treatment.** [Russian.]  
*Soviet Subtropics*, 1939, No. 10 (62), pp. 43-4.

Fertilizer trials with tung trees in the humid subtropics of the U.S.S.R. led to the following conclusions:—Tung trees showed generally a strong reaction to fertilizer treatments. The absence of one or two of the three principal nutrients resulted in restricted growth. Plants given complete fertilizer grew taller, thicker foliage and better developed leaf blades. There was no check in the growth of tung trees that were given PK and lime. Boron + complete fertilizer on the other hand visibly inhibited growth. The leaf fall period of tung trees given K, KP, NK and P treatments terminated 3-4 days earlier than that of the controls. All other variants brought the leaf fall to a close at a later date. NP fertilizer without K appeared to be particularly dangerous as inhibiting growth.

1364. HODGSON, R. W. 634.451-1.542.24  
**Girdling to reduce fruit-drop in the Hachiya persimmon.**  
*Proc. Amer. Soc. hort. Sci. for 1938*, 1939, **36** : 405-9.

At the Citrus Experiment Station, Riverside, girdling young unpollinated Hachiya persimmon (the principal variety in California of *Diospyros Kaki*), the crops of which are the result of parthenocarpic fruit development, increased yield at the expense of size and quality.



1365. SAVASTANO, G. 634.63 : 581.47  
 Identificazione delle varietà di olivo. (**Identification of olive varieties by their fruits.**)

*Ann. Staz. sper. Olivicoltura, Pescara, 1939, pp. 99-143, bibl. 6.*

A method of identifying olive varieties from their fruits has been worked out at the Pescara station. It is based on three fundamental elements, namely:—(1) a classification of adequate exactness drawn up on detailed examination of 143 varieties, (2) statistical analysis of particular morphological characters to which one can with approximate certainty assign a descriptive or identifying value, (3) the possession of specimens of the variety for identification.

1366. ANAGNOSTOPOULOS, P. T. 634.63  
**The ecology of the olive in Greece.** [Greek, English summary 1 page.]

*Hort. Res., Athens, 1939, 4 : 113-44, bibl. 10.*

18.6% of the agricultural income of Greece is derived from the olive and Greece comes third in olive oil producing countries. Full particulars are given in this article of 31 varieties of olive not only as to growth characters but as regards the olives produced and their use. The author considers that only 18 of the 31 varieties are worth cultivation under their present cultivation conditions. There would appear to be a distinct correlation between the success or failure of the variety and the number of stomata on the leaves. The fewer the stomata, the better the drought resistance. Notes are included to help those wishing to choose varieties for planting.

1367. SAVASTANO, G. 634.63-1.541.11  
 L'innesto dell'olivo sul *Fraxinus Ornus* L. (**Grafting the olive on the manna ash.**)

*Ann. Staz. sper. Olivicoltura, Pescara, 1939, pp. 147-60, bibl. 15.*

Cleft or crown grafting the olive on to the manna ash (*Fraxinus Ornus* L.) has been carried out in the Province of Macerata for some time on a small scale and it is suggested by Manaresi that it might be very profitably used in particularly dry and rocky soils. It is best done when the stock is 7-8 years old, but the resulting tree is not usually long-lived, only some 6-7 years. Allowing the rootstock to send out a small proportion of shoots is said to increase the life of the combination. Notes are given of other plants on which the olive has been grafted at different times with a certain degree of success:—*Ligustrum* spp., *Phillyraea variabilis*, *Forastiera durangensis*, *Fontanesia phillyraeoides*, *Fraxinus excelsior*, *Olea europaea* var. *oleaster*, *O. europaea* var. *domestica*, *O. chrysophylla*, *O. cuspidata*.

1368. SAVASTANO, G., AND MARCUCCI, G. B. 634.63 : 581.144/5  
 Sulla differenziazione istologica delle gemme a legno ed a frutto dell'olivo e problemi di tecnica culturale inerenti. (**Histological differentiation of wood and fruit buds in the olive and practical problems affected thereby.**)  
 Reprinted from *Atti Convegno nazionale Olivicoltura, Bari, 1938, 1939, pp. 26, bibl. 43.*

In this article the authors discuss not only the work of other authors on the differentiation of buds, especially fruit buds, in different fruits and flowers, but also their own observations made in 1934 and subsequent years on the development of buds in the olive. If the factors, external and internal, which determine this differentiation could once be properly understood, it might be possible to influence differentiation in the direction required by the olive grower. They summarize as follows:—(1) All buds on the current year's shoots of an olive up to the end of the summer are of one type only:—this is quiescent and may be called a neuter bud. Neither in shape nor physiology does this show any tendency towards a fruit or vegetative bud. (2) In autumn some of the neuter buds in the apex of the young shoots and others in the leaf axils undergo a histological change of tissue into wood buds; all the rest remain in a state of latent life. (3) At the end of winter or beginning of spring, 10 to 15 days before the beginning of

flowering, all the growing points of the neuter buds—except of those which will become dormant—start histological differentiation into leaf buds in the case of apical buds and into leaf or flower buds in the case of the axillary buds. (4) During this last stage some of the growing points of the axillary buds, which have already started to become leaf buds, may undergo a secondary histological differentiation into flower buds; this phenomenon, which deviates from the normal course of differentiation of flower buds from neuter buds, is an anomaly.

1369. SAVASTANO, G. 634.63-1.8  
Sperimentazione e concimazione dell'olivo. (**Experiments on the manuring of olives.**)

Reprinted from *Concimi e Concimazioni*, 1938, Vol. 3, No. 6, pp. 14.

The author gives an account of manurial experiments laid out in 8 centres in Italy to determine firstly the effects of increasing the amount of N, P and K fertilizer elements and of including green manuring and secondly the best time for applying nitrogen. As regards the first the plan of each lay-out is 3 increasing differential treatments repeated 5 times. Each plot consists of 9 trees. As regards the time of N application N is being given at the following times: at the end of autumn, the end of the winter, two-thirds at the end of autumn and one-third at the end of winter, one-third at the end of autumn and two-thirds at the end of winter. The results of the first year are discussed. In addition the physiological effects of manuring in general are considered, the previous neglect of olive manuring in Italy is deplored, and the way in which a totalitarian state is starting to put the matter right is applauded.

1370. HEWITT, W. B. 634.63-2.3  
**Leaf-scar infection in relation to the olive knot disease.**  
*Hilgardia*, 1938, 12: 39-72, bibl. 6.

The author's experiments were carried out mainly on the Mission variety of olive in a Sacramento orchard of California. They show that the leaf scars of olive under certain conditions afford entrance to the spores of *Bacterium Savastanoi* E.F.S., the causal agent of olive knot disease.

1371. HOFMEYR, J. D. J., AND LE ROUX, J. C. 634.651  
**The culture of the papaw.**  
*Fmg S. Afr.*, 1939, 14: 325-9, bibl. 6.

An account of the methods most suitable for the cultivation of the papaw (*Carica Papaya*) in S. Africa.

1372. CASTELLI, E. 634.651  
**Conclusions arrived at after thorough investigation of the cultivation of the papaw and its industrial applications.**  
*Proc. agric. Soc. Trin. Tob.*, 1939, 39: 25-32, 77-85, 129-31, 165-70, 219-20.

The author, who is a resident of Trinidad, urges the cultivation of the papaw (*Carica Papaya*) in Trinidad on a large scale with the object of exploiting co-operatively the nutritive, digestive and vitamin value of the fruit in the manufacture of dietetic products. The author disposes of papaya mosaic by assuming it to be, not a virus, but a deficiency disease and therefore easily controlled, once the nature of the deficiency has been determined. The fruit fly, too, he says, can be controlled (a) by growing thick-fleshed varieties so that the fly cannot reach with her ovipositor the central seed chamber where the egg is laid and (b) by growing plants that ripen slowly, since the larvae when trying to escape from the seed chamber before the fruit is ripe are killed by the juice of the unripe fruits; he says also that, while the fly lays its eggs indiscriminately on fruit of healthy and unhealthy trees, the larvae only survive in the unhealthy fruits, in which the papain is not sufficiently strong to digest the eggs as happens in the case of healthy fruits. These deductions are based on the author's part, it is explained, on observation and not on actual experiment.

1373. REECE, P. C. 634.653 : 581.462  
**The floral anatomy of the avocado.**  
*Amer. J. Bot.*, 26 : 429-33, bibl. 8.

A purely botanical study of the flower of the avocado (*Persea gratissima* Gaertn) revealing how the species has originated. It is clearly a specialized form derived from a primitive angiosperm stock and the course of this evolution is discussed.

1374. TORRES, J. P. 634.653-1.541.6  
**Some notes on tongue-inarching of the avocado.**  
*Philipp. J. Agric.*, 1939, 10 : 11-7, 19, bibl. 4.

A modification of the ordinary method of inarching or approach grafting is described. In this method, after the outer surfaces of stock and scion are pared as usual, a tongue is cut farther into the wood, behind each of these cut surfaces, as in the whip and tongue graft but of greater length. The tongue on the stock is cut from above downwards and on the scion from below upwards, so that when placed in position the split portions interlock, one behind the other. The tie is made with waxed tape. Advantages claimed over the ordinary method are :—There are 3 lines of contact instead of one, so that union is quicker and more certain and the date when the plants may be severed is reduced by 4 weeks or more (the usual time for ordinary inarching with the avocado is from 8-12 weeks), there is a firmer union and a more rapid sap flow and consequently growth; stock and scion need not be of equal width; if, however, the stock is narrower than the scion the part below the union may remain small for some time. Preliminary trials have shown a 99% take for the improved method of inarching against 66% for the ordinary method, a maximum of 40% for marcotting and a maximum of 65% for budding. Types of avocado that fail to bud owing to the unsuitability of the budwood can be tongue-inarched with ease; the operation can also be done all the year round in wet or dry seasons, and overgrown stocks unsuitable for budding or grafting can be used. It is recommended that instead of pruning off low-hanging branches of choice varieties they should instead be tongue-inarched. A number of other fruits have responded well to the method. The description is well illustrated.

1375. STEVENS, H. E. 634.653-2.8  
**Avocado sun-blotch in Florida.**  
*Phytopathology*, 1939, 29 : 537-41, bibl. 3.

Notes on observations on the incidence of sun-blotch, apparently a virus disease, on Taylor and Nabal varieties of avocado topworked on Taft trees in Florida.

1376. WEBER, G. F. 635.646 : 632.48  
**Phomopsis blight of eggplants.**  
*Pr. Bull. Fla agric. Exp. Stat.* 522, 1938, pp. 2.

The control of *Phomopsis* blight of eggplants begins with the selection of the seed. If it is doubtful whether it is disease-free, it should be carefully disinfected by soaking for 6 to 8 minutes in a 1 : 1,000 solution of corrosive sublimate. This treatment will destroy spores of the fungus adhering to the seed coat, but will not kill the mycelium that has penetrated it. The grower must also prepare a seedbed on disease-free or disinfected soil. The field to which the seedlings are to be transplanted should not have been planted to eggplants for several years. Spraying with 4-4-50 bordeaux mixture or 20-80 copper-lime should be done at weekly intervals during the early season. Rigid hygiene should be observed.

1377. BRZHEZITSKY, M. B. 632.51  
**Weeds in the dry subtropics of Azerbaijan.** [Russian.]  
*Soviet Subtropics*, 1939, No. 9(61), pp. 42-4.



## TROPICAL CROPS.

1378. HUTSON, J. C. 351.823.1 : 632.9

**Plant import legislation in Ceylon.**

*Trop. Agriculturist*, 1939, **92** : 288-301, bibl. 3.

An account of methods adopted in Ceylon for inspection and fumigation of both imported and exported plants, together with copies of Plant Protection Ordinance No. 10 of 1924 and of Directions given under that ordinance in 1938, and of the Certificate of Examination of Plants for Export.

1379. JOACHIM, A. W. R. 631.459 : 351.823.1

**Summary of legislation or other governmental action on soil conservation in various countries.**

*Trop. Agriculturist*, 1939, **92** : 224-33, bibl. in text.

A brief review is given of the measures taken in many countries to cope with the problem of soil erosion.

1380. ZAAIJER, J. W. 632.951

**Het insecticide *Derris elliptica*, cultuur en bereiding. (Cultivation and preparation of derris.)**

*Bergcultures*, 1939, **13** : 116-27, bibl. 49.

This article would appear to contain nothing new.

1381. LINFORD, M. B., AND YAP, F. 632.651.3 : 632.96

**Root-knot nematode injury restricted by a fungus.**

*Phytopathology*, 1939, **29** : 596-608, bibl. 10.

Species of fungi which destroy nematodes readily in agar differ in ability to restrict nematode injury in soil, a fact which makes soil tests necessary. During 15 months' continuous plant growth in pots containing sterilized soil infested with larvæ of *Heterodera marioni*, to which pure fungal cultures were added, *Dactylella ellipsozona* restricted nematode injury in pineapples to a moderate though statistically significant extent.

1382. DIAS, S. J. F., AND THAMOTHERAM, T. V. 632.64

**The control of the giant snail (*Achatina fulica* Fer.) at the Tabbowa vegetable seed station by the use of meta-bran bait traps.**

*Trop. Agriculturist*, 1939, **92** : 222-3.

At the station mentioned in the title 107,038 giant snails were destroyed in four months by meta-bran baits set under shelters of corrugated iron, 9" x 8", placed at 15 and later at 10 foot intervals. In the first month only 88 traps and in the remaining 3 months 432, 500 and 555 traps respectively were used. The bait was made up of 1 oz. meta to 2 lb. rice bran mixed to a stiff mash in water. Baits which hardened or dried were collected, broken up, rewetted, and used again.

1383. MYSORE. 633.83-2.78

**The cardamom hairy caterpillar (Fam. *Eupte-Rotidae*) and its control in the Mysore State.**

*Circ. Mysore St. Dep. Agric.* **65**, 1939, pp. 4.

The most important and effective measure of controlling the cardamom hairy caterpillar consists of collecting and destroying the pupæ found in the loose earth and excreta mixed up underneath the shade trees where the caterpillars have been noticed to congregate. Of the natural enemies an unidentified fungus showed much promise.

1384. CEYLON, DEPARTMENT OF AGRICULTURE. 632.952.21  
**Copper emulsion.**  
*Leaflet. Ceylon Dep. Agric.* **117**, 1937, being *Sprays and Spraying Leaflet 2*.  
 CEYLON, DEPARTMENT OF AGRICULTURE. 632.951.2  
**Concentrated lime sulphur.**  
*Leaflet. Ceylon Dep. Agric.* **118**, 1937, being *Sprays and Spraying Leaflet 3*.
1385. KONDŌ, M., TAKAHASHI, R., AND TERASAKA, Y. 632.951.1  
 Berichte über die Tätigkeit des Ausschusses für die Samen der warmen Klimate. V. Vergleichende Untersuchungen der Samen von *Chrysanthemum cinerariaefolium* Bocc., 1937. (Reports of a special investigation board dealing with seed of the warm climate zones. V. Comparative studies of the seed of *Chrysanthemum cinerariaefolium* Bocc. 1937.)  
*Ber. Ohara Inst.*, 1938, **8** : 1-9.

Tabulated results are here given of tests of the seed of pyrethrum (*Chrysanthemum cinerariaefolium* Bocc.) carried out by (i) the Division of Seed Investigation, Bureau of Plant Industry, Washington, U.S.A., (ii) the Seed-Testing Station, Palmerston North, New Zealand, (iii) the Ohara Institute, Kurashiki, Japan, (iv) the Laboratorio Analisi Sementi, Bologna, Italy, and (v) the Official Seed Testing Station, Giza, Egypt. There was no report from Madrid, where similar seed tests were also to be made. All seed samples came from Japan. They included early, late and intermediate varieties. There were considerable discrepancies between the data obtained at the different institutes in analyses of the seed. Several explanations are offered. It is concluded that it is not practical to use blast separators for determinations of purity of the seed by the quick method, though their use is recommended for growers wishing to increase the percentage of viable seed for sowing.

1386. MULLER, H. R. A. 633.491-2.3/4  
 Onderzoekingen over aardappelziekten.\* (Investigations on potato diseases in the tropics.) [English summary 2 pp.]  
*Meded. alg. Proefst. Landb.*, 1939, **33** : 1-22, being *Meded. Inst. PlZiekt.* **93**.  
 A study of the *Colletotrichum* disease of potatoes in Java led to the conclusion that this disease causes serious tuber rot and wilt only if the potatoes are shipped too late in the season or if they are weakened in some other way. Field trials showed that an infection of potato crop is more likely to occur when *Colletotrichum* infested seed tubers are used, but that it is possible to obtain a nearly healthy crop from 100% diseased seed tubers. Experiments on storing *Colletotrichum* infested potatoes showed that a high temperature and a high air humidity favoured the development of *Colletotrichum* tuber rot. Under normal conditions the rot was of no importance. As a result of these investigations the regulations concerning the importation of *Colletotrichum* infested lots of seed potatoes have been somewhat relaxed. Breeding for blight resistance is being carried on under the supervision of the Institute for Plant Diseases.

1387. DAVID, P. A. 633.525.1  
**Ramie and its cultivation in Davao.**  
*Philipp. Agric.*, 1939, **28** : 38-43.

The methods of two Japanese companies in the Philippines growing a special variety of ramie (*Boehmeria nivea* Gaud.) known as Saikeseisin (a name compounded of words meaning fine, stem, green and pith) are described. The first crop is cut 6 months after planting and thereafter every 2 months. The life of the ramie plant is given as 14 years, the peak of production being in the 4th and 5th years. A profit is shown in the 2nd year and cultivation ceases to be profitable at the end of the 8th year. Soil fertility is maintained by the aid of nitrogenous manures and the return of all vegetable waste to the soil.

\* A continuation of article in *Landbouw*, 1937, **13** : 285-313.

1388. CALINISAN, M. R. 633.526.1 : 632.8  
**A comprehensive study on symptoms of abaca mosaic.**  
*Philipp. J. Agric.*, 1939, 10 : 121-7, 129-30, bibl. 6.

The paper claims to be an exhaustive study on the mosaic disease of manila hemp in the Philippines. Symptoms of the disease in the principal parts of the plant are described. There are 9 plates illustrating various aspects of it.

1389. GLOVER, J. 633.526.23 : 581.144.2  
**The root-system of sisal in some East African soils.\***  
*E. Afr. agric. J.*, 1939, 5 : 18-22.

The investigations are reported from Amani, Tanganyika ; much of the work was carried out at the Sisal Experiment Station, Mlingano. In normal sisal soils the main concentration of sisal roots is in the top 30 inches though on certain good soils they may penetrate to 5 feet or more ; lateral extension in a normal soil is 10-15 feet. The common plantation spacing of  $8 \times 3\frac{1}{4}$  feet between plants is therefore too close and wider experimental spacings have increased yield. There is also severe competition between weeds and sisal roots, especially in regions with a badly distributed rainfall, and clean weeded experimental plots produce a larger leaf and earlier crop. The reaction of the soil to drought is important. Sandy soils dry out quickly but allow even slight showers to penetrate to the roots quickly ; in loamy clay the plants will not suffer from drought so quickly, but in severe drought light rains will be absorbed in the top few inches and the plants with no water for their deeper root systems will take longer to recover. Weeds will also render light showers ineffective by intercepting the water with their leaves, from which it will be evaporated without reaching the ground. Within wide limits the pH value of the soil does not seem to affect the growth of sisal. As the poling shoots mature, the feeding root system shows progressive signs of degeneration. Sisal will not grow on swampy soils. A water table will cause the death of roots 12-18 inches above it.

1390. DEN DOOP, J. E. A. 633.526.23 : 1.57  
**The utilization of sisal waste in Java and Sumatra. III and IV.**  
*E. Afr. agric. J.*, 1939, 4 : 343-51, 415-25.

The series, of which parts I and II† have been previously briefly noted, is continued in III and IV with a discussion on the course of depletion of a Java sisal soil type of its most important food reserves and organic matter during the progress of exhaustion. The results of the experiments discussed are held to prove the great importance of organic as well as chemical nutritional additions to the soil of sisal plantations.

1391. WELLENSIEK, S. J. 633.72-1.541.5  
**Waarnemingen aan oculaties op jonge theeheesters. (Observations on bud-grafted tea.)** [English summary.]  
*Arch. Theecult. Ned.-Ind.*, 1938, 12 : 107-26, bibl. 4.

In budding tea it is immaterial as regards percentage of takes whether own budwood or budwood from another source is used. Using own budwood, however, there was a 20% decrease in yield during the whole of the period of first yield ; it is caused by the small number of shoots which build up the frame, 2.5 as against 8.0 with unbudded plants. The decrease diminishes after pruning. The correlation of the average clonal yields with 8 and with 48 determinations is very high, so that a limited number of yield determinations will do. The average clonal yields increase considerably during the total production period in comparison with unbudded or self-budded plants especially with the better yielding clones. Five selected clones showed an increase of 800 kg. of made tea per hectare over unbudded tea, though for the first 4 years there was a decrease. It is claimed that these clones were only roughly selected and that a narrower selection would have increased yields still further. Stock influence on yield is obvious, but

\* See also *Emp. J. exp. Agric.*, 1939, 7 : 11-20, *H.A.*, 9 : 239.

† *Ibidem*, 1938, 3 : 423-38, 4 : 89-99, *H.A.*, 8 : 1196.



the question has not been investigated ; it is, however, subordinate to clonal influence on yield. The budding of young plucking bushes, especially those originally obtained by nursery selection, is advised.

1392. ANUFRIEV, M. F. 633.72 : 577.16

**Vitamin C content in tea.** [Russian, English summary 9 lines.]

*Soviet Subtropics*, 1939, No. 9 (61), pp. 54-5.

Analyses made by the Glavchai Central Laboratory showed that both a black tea and green tea blends processed at Chakva showed great loss in vitamin C content after storage for 5 months. In order to obtain tea that does not lose all its vitamin C content during prolonged storage, experiments were made of adding a dry vitamin C preparation to tea dust and compressing the mixture into tablets each weighing 3 g. The taste of the tea was not impaired and it was capable of relatively long storage, particularly when stored in air-tight tins. The study of packing and different storage conditions as affecting the vitamin C content of ordinary tea and tea tablets is being carried on.

1393. PATARAYA, SH.I. 632.944 : 633.72

**The effect of cyanide on tea pests and the tea plant.** [Russian.]

*Soviet Subtropics*, 1939, No. 10 (62), pp. 46-9.

Results are reported here of tea pest control trials under commercial conditions in U.S.S.R. The trials were conducted by the Institute for Tea and Subtropical Cultures. Among conclusions reached are the following : (1) 50 g. cyanide dust per square metre did not effectively control the tea moth caterpillar. (2) From 20 October to 10 April, i.e. a time when no tea leaves are being picked, cyanide may be used with advantage for *Pulvinaria floccifera* West. control. (3) In spring and autumn at temperatures above 18° C. cyanide dust can be effectively used against scales and beetles (25g. per square metre, treated plants held under the tent for 40-50 minutes). At temperatures from 10-18° C. the amounts of cyanide used are larger and the exposures longer. (4) Summer treatments (20 g. per square metre and exposures of 30-40 min.) gave a very high mortality of *P. floccifera* larvae (90-100%), but it resulted in severe scalding of flushes and foliage (50-80%). (5) The severer the pruning, the fewer were tea moth caterpillars found and the higher were the yields in subsequent years.

1394. LAMOTTE, P. 633.73

De koffiecultuur in Britisch Oost-Afrika, in het bijzonder in Kenya. (**Coffee production in B.E.A., particularly in Kenya.**)

*Bergcultures*, 1939, 13 : 150-6, reprinted from *Bull. comm. belge*, 1938, No. 49, Dec. 5.

An account of the coffee industry of British East Africa by the Belgian Consul-General at Nairobi. The emphasis is on the organization of the export and marketing side rather than on cultivation methods, though the measures taken to improve quality are noticed.

1395. GILBERT, S. M. 633.73-1.521

**Selection within *Coffea arabica* in Tanganyika Territory.**

*E. Afr. agric. J.*, 1939, 4 : 249-53.

The technique of coffee selection within *arabica* coffee as recently worked out at the Lyamungu Coffee Research Station, Tanganyika, is described. *Yield.* The average yield of cherry is 1.5 kg. per tree per annum, the minimum standard of selection at present is 8.5 kg. of cherry per tree. *Quality.* Points awarded for quality under roast and liquor are difficult to assess precisely, but points under raw can be accurately measured. A random sample of 350 beans from the whole crop of one tree is sufficient. Weight is so positively correlated with volume ( $r = +.992$  average for 6 trees examined) that the latter measurement becomes unnecessary. Density may be correlated to quality however, and therefore a general idea as to volume is obtained by screening for length, width and boldness. It has to be borne in mind that the above characters may be almost certainly affected by cultural operations. *Field characters.* Trees

that do not do well on the single stem system of pruning may do so on one of the forms of multiple stem. On steep hillsides anti-erosion measures may require an upright type of growth instead of a spreading one. These and many other points have to be taken into consideration in final selection. Other characters still to be studied are time of flowering, flushing habit and wind and drought resistance.

1396. DE LIGT, N. M. 633.73  
 Conuga-koffie. (*Conuga coffee*).  
*Bergcultures*, 1939, **13** : 726-32.

The paper, read at the 9th East Java Planters' Congress in May 1939, extols the merits in the plantation of Conuga coffee. Apparently it gives no trouble and yields heavily, much exceeding *robusta*. It requires careful drying or the taste will be rank, but given this it is again a long way ahead of *robusta*. Congeniality with its rootstock seems a matter of course with Conuga, and it appears to have a considerable effect on rootgrowth of the stock. Photographs show the rootgrowth of various coffee rootstock varieties including *arabica* when grafted with Conuga scions, and without exception the mass of roots produced in a few years is enormous.

1397. FRANCO, C. M. 633.73 : 575 : 581.12  
 Relation between chromosome number and stomata in *Coffea*.  
*Bot. Gaz.*, 1939, **100** : 817-27, bibl. 7.

The investigations were carried out at the Instituto Agronomico do Estado de São Paulo, Campinas, Brazil. The number of stomata per unit area of leaf surface in coffee decreases and the area of an individual stoma increases with a doubling of the chromosome number.

1398. KRUG, C. A. 633.73 : 575.1  
 The genetics of *Coffea*. Part I. The inheritance of a dwarf type—*nana*.  
*J. Genet.*, 1938, **37** : 14-50, bibl. 10.

Genetical work at the Instituto Agronomico do Estado de São Paulo, Campinas, Brazil.

1399. ROELOFSEN, P. A. 633.73-1.535  
 Het stekken van koffie. (*Propagation of coffee by cuttings*).  
*Bergcultures*, 1939, **13** : 994-1002.

A description of the rooting of *robusta* and Conuga coffee cuttings in unheated glass frames in Java. This is already a published routine method with *arabica* at the research stations in Tanganyika and Kenya, and therefore technique and appliances common to all will not be described in this abstract. In Java the glass frames are covered with a white material resembling muslin, which is kept permanently moist by the leakage of water through perforations in a bamboo pipe running along the back of the frame (the lights slide under it). The pipe is fed from drums into which water is pumped as required. The moisture thus provided reduces the temperature in the frames from 95° F. to 84° F. making the difference between life and death for the cuttings. The white cover is only used on sunny days and then only from 8 a.m. to 3 p.m. Two metres above ground or 1.20 m. from the top of the frame is a lattice-work roof made of interlacing bamboo strips 19 mm. wide with 17 mm. intervals. This is supposed to admit one-quarter of the available sunlight. The essentials for success are plenty of light evenly diffused, combined with a cool temperature. The cuttings used are the upper portion of the shoots and consist of 2 or 3 joints and are 20-30 cm. long. Shorter cuttings usually die, as do older ones. A shoot may make two cuttings but never more. The importance of doing everything possible to guard the leaves of the cuttings from damage during transport, etc., is stressed. Damaged leaves soon fall and without leaves the cuttings will not strike. In two months the cuttings are lifted for examination and those that have rooted are planted in baskets, kept under glass a further month and then stood out in the shade. In the rainy season the extra month under glass is dispensed with. In six months from the time at which the cutting was made it should be ready for planting out. *Rhizoctonia* attack is found troublesome, especially in wet weather, but is checked by weekly bordeaux sprays and the admission of all the light possible.

Even when the cuttings are not attacked the rainy season is the more unfavourable for rooting and this is attributed entirely to the reduced light. Cuttings from fan branches grow horizontally while their root spread is also lateral. Rooted cuttings are not ready to be used as rootstocks for about a year. They can, however, be grafted at the time that the cutting is made; the successful takes (about 50%) are much lower than on rooted stocks, but the method enables clonal stock/scion combinations to be made at will and without delay. It is immaterial with coffee cuttings whether the basal cut is made above or below a joint. The application of growth hormones in water was useless and even harmful. A continuous feed of a lanolin hormone mixture maintained at the cut apex was more useful. Though not a completely efficient substitute for the removed top it was nevertheless very much more successful than the topped untreated controls, which gave particularly bad results on this occasion. There are marked clonal differences in ability to root. The necessity for studying the rootstock question is pointed out. Coffee is strongly susceptible to rootstock influence; as yet little work has been done on this question.

1400. WILBRINK, W. G. J. 633.73-1.541.  
 Takent contra waaierak. Is verenting noodzakelijk? (**Branch grafting versus the fan branch in coffee. Is grafting necessary?**)  
*Bergcultures*, 1939, 13 : 933-7.

The paper describes how a decaying coffee plantation (*robusta*) in Java was rejuvenated and induced to produce heavily bearing fan branches without having to be topworked. The process involved drastic but not complete reduction of shade, heavy mulching and severe pruning. In pruning every weakly branch was completely removed, those not certain to fruit were cut back severely and fruiting branches were also cut, to a less extent but irrespective of the loss of crop. As a result of this the bushes produced fan branches which grew vigorously and in the following year yielded more than double the usual crop, a yield which is expected to be increased by 40% in the coming season. The reasons for this gratifying result are discussed at some length as also the reason for the production of the desirable fan branch in place of water shoots. It is pointed out that the rainfall is normally heavy and that there is never any prolonged drought.

1401. SCHWEIZER, J. 633.73-1.541  
 Demonstratie van koffie-takenten op Kaliwining. (**Demonstration of coffee branch-grafting at Kaliwining.**)  
*Bergcultures*, 1939, 13 : 954-65, bibl. 12.

A lecture and demonstration on the nature and physiology of fan branching in coffee and of branch grafting so as to produce fan branching in the scion.

1402. HENDRICKX, F. L. 633.73-2.482 : 581.145.2  
 Observations sur la maladie verruqueuse des fruits du caféier. (**Botrytis disease on coffee fruits.**)  
*Publ. Inst. nat. Étude agron. Congo belge, Sér. sci.*, 19, 1939, pp. 12, bibl. 17, Fr. 3.

In 1938 a *Botrytis* disease was discovered in a *Coffee arabica* plantation south-west of Kivu. The causal organism which did not resemble any form or species known has been provisionally named *Botrytis cinerea* Link. fa *coffea*.

1403. BREDO, H. J. 633.73-2.3/4+2.6/7  
 Catalogue des principaux insectes et nématodes parasites des cafés au Congo Belge. (**Pests and nematodes infesting coffee in the Belgian Congo.**)  
*Bull. agric. Congo belge*, 1939, 30 : 266-307.

Descriptions, biological notes and control measures are given for 67 insect and nematode pests of coffee in the Belgian Congo. There are 32 illustrations showing either the insects themselves or some characteristic injuries by which the pest may be recognized. There is an index in which the insects are grouped according to the part of the plant attacked.



1404. LANUZA, E. A. 633.74  
**The cacao industry in the Philippines.**  
*Philipp. J. Agric.*, 1939, 10 : 69-75, bibl. 8.

The author points out that whereas the consumption of cacao in the Philippines is 3,000 tons annually, 2,000 tons of this has to be imported, an unfortunate circumstance in view of the fact that the climate of the islands is ideal for the crop. In urging an extension of planting he optimistically claims that the consumption of cacao will in due time outstrip production to such an extent as to cause a serious shortage. A brief sketch of the methods of cultivation in the Philippines is given. Modernity is not exactly their keynote.

1405. DOM, C. A. W. 633.74  
 Enkele korte mededeelingen betreffende de cacaocultuur. (**Short communications on cacao cultivation.**)  
*Bergcultures*, 1939, 13 : 178-9, bibl. in text.

I. A much cheaper method of persuading the black ant to take up its residence in cacao trees than the provision of bamboo-joint nests is to pin a dead leaf picked up from the ground to the underside of a living leaf. The ant will accept this fragile home. The cost in Java is only 1½ florins per hectare per annum, a tenth of the cost of the old method. About 20 leaf nests per tree are enough. [The presence and behaviour of the ant is considered as a useful index to the state of health of the cacao tree.—ED.]

II. After about 20 years or so budded cacao trees begin to deteriorate in various ways. This too early senescence is here attributed to a growing incompatibility between stock and scion, the origin of which can be traced to the time when the plants were budded. Measures are suggested to prevent this ultimate breakdown. Budding should only be done when stock and scion are at the beginning of a flush. The bud shield should be of similar age to the bark in which it is to be placed ; to determine this is largely a matter of practice, similarity in colour of the bark being no criterion. It follows that the older stock wood must be budded higher than is customary. This high budding is, however, positively beneficial with cacao. Too low budding is the cause of many failures to unite and also accounts for much stock/scion incompatibility. Union between stock and scion should be complete within 20 days. The shoot aided by partly cutting back or bending the stock should then at once start into growth. If it has not started within a month of loosening the tie it should be discarded.

1406. COPE, F. W. 633.74 : 581.162.3  
**A note on the range of compatibility in cacao.**  
*Eighth A.R. on Cacao Research for 1938*, I.C.T.A., Trinidad, 1939, pp. 16-7, bibl. 4.

The success of hand self-pollinations in self-compatible cacao trees varies from tree to tree, some trees setting very easily and some others less readily from hand self-pollinations. There appears to be therefore a range in self-compatibility. The success of hand self-pollinations varies from time to time during the year. [From author's summary.]

1407. COPE, F. W. 633.74 : 581.162.3  
**Compatibility and fruit-setting in cacao.**  
*Eighth A.R. on Cacao Research for 1938*, I.C.T.A., Trinidad, 1939, pp. 17-20, bibl. 8.

Cross-pollinations made between self-incompatible cacao trees are over twice as successful in result as self-pollinations. The setting of cherelles on either self-compatible or self-incompatible trees is not so much dependent upon potential supply of pollen from immediately neighbouring trees but rather upon each tree's individual flower production, indicating that the pollen vector may visit flowers widely separated in space. [Author's summary.]

1408. COPE, F. W. 633.74-1.55  
**Some factors controlling the yield of young cacao II.\***  
*Eighth A.R. on Cacao Research for 1938*, I.C.T.A., Trinidad, 1939, pp. 4-15,  
 bibl. 3.

It is shown statistically that the self-incompatible cacao tree produces many more flowers than the self-compatible, but that the self-compatible tree is superior in final harvested yield. No significant results on fruit set were obtained from manurial treatment except that pod yields were enhanced by the use of potash. Self-incompatibles benefited more by the application of manures than the self-compatible. A warning is given against regarding self-incompatibility as the major cause of low yields, since under certain conditions a self-incompatible tree may yield as highly as a self-compatible; nevertheless, to eliminate the hazards attendant on the necessity for cross pollination, the best planting material is that which is self-compatible throughout.

1409. VOELCKER, O. J. 633.74 : 581.162.3  
**Growth rate of cross- and self-fertilized cacao.**  
*Trop. Agriculture, Trin.*, 1939, 16 : 203-5, bibl. 1.

The cross-fertilized progeny of ten Nigerian [cacao] selections showed no significant increase in vigour over self-fertilized progeny from the same trees. But hybrid vigour might have been noticed had there been more variation among the selections. [Author's summary.]

1410. HARDY, F. 633.74  
**The maximum yield of cacao.**  
*Trop. Agriculture, Trin.*, 1939, 16 : 179-91, bibl. 22.

Some of the factors contributing to high yield in cacao are discussed. These are divided into genetic and environmental factors, though in practically every case the efficacy of the genetic factors is modified by environmental conditions.

1411. HARDY, F. 633.74-1.8  
**Manurial experiments on cacao in Trinidad—summary of results for 1938.**  
*Eighth A.R. on Cacao Research for 1938*, I.C.T.A., Trinidad, 1939, pp. 27-34.

This paper is a review of Dr. F. J. Pound's report for the year ending August 1938 submitted to the Cacao Subsidy Board. Some of the general findings are as follows. The value of pen manure for shaded cacao was found in all but certain poor shallow soils to lie in the potash and not in the nitrogen, though cellulosic and other carbohydrate components and occasionally phosphates may also be effective on some soils. Unshaded cacao may benefit from applied nitrogen since the nitrogen supplied by the immortal shade trees is then absent. It is unprofitable to manure cacao that has not been put by general cultural treatment such as draining, pruning, etc., into a suitably healthy condition to receive it. Initial large dressings should be succeeded by small annual dressings to maintain a high level of soil fertility. Phosphatic manures may produce very large immediate increases when applied to phosphate-deficient clay soils, but slow-acting ground rock phosphate may prove equally effective in the long run. A relationship possibly unique in the nutrition of fruit trees is the fact that over-liberal potash manuring may markedly depress yields. Manures are best applied at a time when the young fruit is setting. Chemical laboratory soil tests have proved reliable in indicating initial deficiencies of available phosphate and potash on land to be planted. A yield increase of 24% was obtained as a result of the application of 3,000 lb. of cane sugar per acre. The highest yield recorded for an experimental plot liberally manured with pen and artificials was 2,088 lb. per acre on soil, however, on which the natural yield was already as much as 1,200 lb. per acre. Combined drainage and shade experiments showed that the higher the shade intensity the less need there was of drainage and that drains were most effective when placed close together under light shade.

\* Part I, 7th A.R. for 1937, pp. 14-8, H.A., 8 : 1128.

1412. MOLODOZHNIKOV, M. M., MOMOT, K. G., SNIGIREV, D. P., AND TARAN, E. N. 633.88.51

**The cinchona tree in the Soviet subtropics.** [English summaries.]

*Trud. Introd. Nurs. subtr. Cult. Sukhum*, 1938, No. 7, pp. 177, bibl. 75.

The four authors deal respectively in the order of the title with (1) the solution of the problems involved in cultivating *Cinchona* in Russia; (2) propagation by cuttings; (3) alkaloids from one-year-old cinchona plants; (4) the chemical nature of the plant as grown under Russian conditions. A historical review is given of attempts to cultivate *Cinchona* in sub-tropical Russia for the past 50 years. Until 1932 it can all be classed as empirical experimentation and the results were negligible. Work was based on the assumption that only the bark could be used and that the tree must therefore stand a number of years out of doors. The author (1) approached the problem from a new angle as a result of which the entire plant is now used for the extraction of salts of cinchona alkaloids. Following on this it became unnecessary to grow the plants for longer than a year. (2) The second author describes the method of cultivation. This requires the annual renewal of planting material in very large quantities. Cuttings are rooted in summer under glass with bottom heat and remaining under this cover all the winter are planted out 70,000-100,000 per hectare in the spring. In the autumn the plants are dug up and processed. For supply of cuttings special nursery plots are maintained out of doors in summer and under glass in heat in winter. The method of taking the cuttings and the conditions of light, heat and humidity for best results are described. Attempts are made to keep the summer-rooted cuttings through the winter under glass at a low temperature and down to 44-46° F. there has been fair success. Prolonged low temperatures are harmful and provision must be made for heating the beds if necessary. *C. succirubra* responds best to the treatment. (3) One-year-old plants of *C. succirubra* grown under Russian conditions contain the following percentage of alkaloids:—stems 1.27%, roots 1.47%, leaves 1.32%.

1413. RUBBER RESEARCH INSTITUTE OF MALAYA. 633.912-1.541.5

**Bud-grafting.**

*Planting Manual Rubb. Res. Inst. Malaya* 8, 1939, pp. 61, 50 cts.

Practical instructions are given for bud-grafting *Hevea*, written in English, Malay, Chinese and Tamil and illustrated by "close-up" photographs showing every phase of the technique with remarkable clarity.

1414. RUBBER RESEARCH INSTITUTE OF MALAYA. 633.912-1.541.5

**Notes on bud-grafting.**

*Circ. Rubb. Res. Inst. Malaya* 4, pp. 2.

A simple explanation of the reasons for bud-grafting and for the use of clonal material, written chiefly for distribution to smallholders and available also in Malay, Chinese and Tamil. It contains a short list of proprietary and non-proprietary clones and of the best clones for general use at present.

1415. RUSCH, F. 633.912-1.541.211

Oculeeren bij *Hevea* werkwijze toegepast op de gouvernements koffie-onderneming "Bangelan". (**Method of budding *Hevea* at the government coffee plantation "Bangelan".**)

*Bergcultures*, 1939, 13 : 1233-5.

Dr Hille Ris Lambers, who contributes a foreword, noted that the Bangelan estate had consistently higher success percentages in take of budded rubber than the majority of estates in Java and at his request the Director describes the technique. *Rootstocks*. Age at time of budding 10-12 months, diameter at 10 cm. above ground =  $2\frac{1}{2}$  cm. Those not reaching this standard were eliminated before or during the budding. The stocks are grown from the seed of either mixed or monoclonal budded plantations. *Spacing*. The stocks stand 60 cm. apart in 3 rows to a bed, 40 cm. between rows. Thus the middle row is easily reached. *Budding*. The method is the modified Forkert. The cut is made  $\pm 8$  cm. from the ground. About 6 cm. of bark is peeled



down and if latex flow is heavy batches of 10-20 stocks are peeled in advance of the budders, otherwise the bud is inserted at once, but the bud is always cut after the stock has been dealt with. In cutting the shield 12-15 mm. broad by 30-45 mm. long, the longitudinal cuts are made first. The thin shaving of wood remaining at the back of the bud is removed, care being taken that the cambium beneath is not touched with fingers or knife. The shield is then trimmed at sides and ends and it is noted that when in place on the stock there is a margin between the cut side edges of stock bark and those of the bud shield of  $\pm 3$  mm. and at the upper edge of  $\pm 1\frac{1}{2}$  cm. The lip is then brought back over the shield. It is particularly important that the lip should be firmly tied so that the patch cannot move. Buds are inserted on the side most easily accessible. There is no evidence of the influence of the prevailing wind on success percentages. Each budder has cotton rag for cleaning the stock and the budding knife. The tying material consists of waxed cotton in strips 75-80 cm. long and  $2\frac{1}{2}$  cm. wide which are usually, if the budder is doing his own tying, hung within reach on a forked stick stuck in the ground. The upper part of the lip is first tied over the bud to about half way down. The tape is then led to the bottom of the patch and wound spirally from below upwards. The firmer the tie the more successful have been the results. Although possibly an unnecessary precaution the tie is washed over with latex to exclude extraneous moisture. It is opened in 16-20 days and the lip cut off. The average percentage of takes at the end of 6 weeks is 91%. A good budder does from 150 to 200 per day; he gets a 5% bonus if his take reaches 90%. Men under instruction who have not acquired reasonable proficiency in 3 days should be replaced. A final selection is made at the end of 6 weeks when each man's results can be finally checked. To hasten the growth processes between stock and bud a preparation known as Socony-vet 2295A is smeared over the bud patch when the tie is removed. Its composition is not indicated.

1416. RUBBER RESEARCH INSTITUTE OF MALAYA. 633.912-1.541.11

**Notes on clones.**

*Circ. Rubb. Res. Inst. Malaya* 5, 1939, pp. 2.

Notes on the characters and planting value of 12 of the best *Hevea* clones for use in Malaya.

1417. RUBBER RESEARCH INSTITUTE OF MALAYA. 633.912-1.531

**The description and lay-out of seed gardens.**

*Circ. Rubb. Res. Inst. Malaya* 6, 1939, pp. 4.

Advice is given on the layout of seed gardens for the production of clonal *Hevea* seed. Duoclone and polyclone seed gardens are discussed, the former being preferred. The best varieties for planting together to ensure cross pollination are mentioned both for duoclone and polyclone gardens. Practically the only advantage of a polyclone garden is that the risk of a small seed crop caused by a difference in flowering time is small. There are several disadvantages and these are discussed, methods of counteracting them as far as possible being described.

1418. SCHWEIZER, J. 631.536 : 633.912 + 633.73

**Over het pagger-plantverbandstelsel bij rubber en koffie. (The strip-planting method for rubber and coffee.)**

*Bergcultures*, 1939, 13 : 74-87, bibl. 7.

The method very fully discussed here is that of planting rubber closely in widely spaced rows. Among the points made are :—The system produces trees of normal trunk thickness, yield and bark renewal; the plants are compensated both above and below ground for close planting in the rows by the two open sides; because of the vigour of the trees the yield is increased; extensions through coffee, empty, or bush land is rendered easier. Even in bare ground planting there are indications that this strip planting is preferable to block planting; for one thing the young trees show normal growth over a longer period before being affected by competition, and, as final selection is based on the youthful test tappings, it provides a longer time for these to be studied with consequently a better chance of discovering the best. Thus the strip planting system combines the advantages of close planting and wide spacing, i.e. a high yield per acre plus plenty of room for normal development, and it allows of the cultivation of another crop,

coffee for instance, between the rows. The most profitable spacing is still to be determined, but two ultimate spacings mentioned as already in use are 1.9 metres in the rows and 14 metres between them and  $1 \times 12.5$  metres.

1419. HEUBEL, G. A. 633.912-1.542.14  
 Voorloopige resultaten van eenige plantverband en uitdunningsproeven bij  
 hevea in Zuid-Sumatra. (**Provisional results of spacing and thinning  
 experiments with rubber in South Sumatra.**)  
*Bergcultures*, 1939, 13 : 641-51, 682-93, bibl. 24.

This paper discusses in some detail the effects on tree form and yield of close and of wide planting of rubber and the results to be expected from thinning. Different clones do not all react to differences in spacing in the same way because their habit of growth is different. Tjir 1, for instance, has a vertical branch growth and is not easily blown over. A. 50 is of the type of which the branches stand out horizontally and quickly die off as the plantation darkens. The group of which B.D. 10 is typical has such a compact crown that the leaves have become accustomed to function in a minimum of light and in close planting the branches seldom die. Such clones often react very favourably to thinning. In B.D. 5, on the other hand, the leaves soon cease to function in reduced light so that the lower branches quickly fall and give the tree crown its distinctive shape. Tjir 16 appears to do particularly well in close plantings. Thus the reactions of each clone need special study. Close planting adversely affects trunk circumference and bark thickness. Bark regeneration is quicker in wide planting. Close planting gives a higher yield per acre in the first years, but whether in later years wide-planted trees with the aid of their undamaged crowns and thicker bark will catch up is not certain from the records. Tree height is little affected by close planting and there can be a reduction in windbreaks. Bark sickness is not influenced by close planting though naturally the cost per acre is higher because of the greater number of trees. In the matter of progressive thinning Tengwall's\* optima at different tree ages (allowing for estate differences in environment) still seem the best to follow until further work has been done (e.g. about 100 trees per acre at 12 years, 85-90 at 18 years).

1420. SOESMAN, J. G. 633.912-1.536  
 Kunstmatige bespoediging van worteluitloop na planten. (**Artificial hastening  
 of root development after planting.**)  
*Bergcultures*, 1939, 13 : 38-41.

A method of transplanting young rubber plants other than by stumping is described. By this method the taproot is cut underground by a special tool (illustrated) at a depth of 40-70 cm., depending on the size of the plant; the lateral roots are not touched; dry ground disturbed in the process is well trodden in. After two or three weeks, to allow new roots to form, the leaves are shortened almost to the petiole and the plants are dug up and transplanted without further root trimming. The method is suitable for cut-back plants and budded plants in which the bud is swelling. Plants so treated start into growth very much more quickly than root-trimmed stumps and there are fewer losses from various causes, such as wind and *Phytophthora*. These claims are supported by photographic evidence.

1421. BAPTIST, E. D. C. 577.15.04 : 633.912  
**Plant hormones.**  
*J. Rubb. Res. Inst. Malaya*, 1939, 9 : 17-39, bibl. 84.

Baptist (1939) carried out preliminary experiments on the response of cuttings of rubber (*Hevea brasiliensis*) to treatment with synthetic plant hormones and proprietary root-forming preparations. Cuttings taken from the basal part of the main stem of one- and two-year-old seedlings

\* Tengwall, T. A., 1931. Resultaten van een uitdunningsproef op de onderneming Soewarne (Results of a thinning experiment). *Bergcultures* 5 : 141-2, and

——— 1930. Het verband tusschen uitdunning en rubber-productie (Thinning out and yield in rubber). *Arch. Rubbercult.* 14 : 63-73. [English translation.]

showed marked stimulation after treatment, the number of cuttings rooting being greatly increased. Leafless hardwood cuttings from the main stem of one- and two-year-old buddings, and one- to three-year-old branches of budded trees showed no response to hormone treatment. The production of new roots on root cuttings was facilitated by suitable hormone applications. In addition to describing his own investigations Baptist gives a brief review of plant hormone literature.

1422. DYCK, A. W. J. 633.912-1.8  
**The amounts and distribution of some of the nutrient elements in the rubber tree.**

*J. Rubb. Res. Inst. Malaya*, 1939, 9 : 6-13.

The distribution and the actual amounts of some of the nutrient elements in the *Hevea* tree are tabulated and the results discussed. A mature tree weighing approximately 12,000 lb. contains 34 lb. nitrogen, 11 lb. phosphoric acid, 39 lb. potash, 58 lb. lime, 15 lb. magnesia. As regards distribution within the tree there is a low potassium content in the wood of the trunk but a high concentration in the bark. The sodium content in trunk and bark is 16, in the twigs 85, and in the petioles 17 times that of the leaves; the sodium in the roots is higher than might be expected. Calcium in the roots is twice and, in leaves, petioles and twigs, 5 times that of the stem. The manganese distribution is somewhat similar to that of calcium. Similar investigations, including spectrographic determination of minor elements, are being carried out on young rubber under different manurial treatments as also investigations on the seasonal variations of nutrient elements in the leaves.

1423. PAGE, H. J. 633.912-1.8 : 581.192  
**The chemical composition of rubber trees in relation to problems of nutrition and manuring.**

*J. Rubb. Res. Inst. Malaya*, 1939, 9 : 14-6.

The director of the Rubber Research Institute discusses the previous paper. The amounts of nutrient elements lost to the trees per acre in an annual leaf-fall are equivalent to 1 ton sulphate of ammonia, 2 cwt. rock phosphate, 3½ cwt. sulphate of potash. These losses should be reduced to a minimum by correct cultural practice, though large losses of nitrogen are bound to occur during the decay of the leaves on the soil surface. This possibly accounts for the importance which nitrogen assumes in all investigations on the nutrition of the rubber tree.

1424. DE FLUITER, H. J. 632.4 : 633.73 + 633.912  
**Enkele minder bekende wortelschimmels van koffie en rubber. (Some less-known root diseases of coffee and rubber.)**

*Bergcultures*, 1939, 13 : 236-43, bibl. 16.

The diseases are those met with by the author during the period 1935-38, and consist of (1) *Armillaria* sp., parasitic on *Coffea robusta*, (2) *Polyporus rugulosus*, of local distribution in *Hevea* nurseries. (3) *Rhizoctonia* species. (4) A non-parasitic fungus (*Pyrenomyces*) which produces quantities of black mycelium but does not penetrate below the surface.

1425. BEELEY, F., AND BAPTIST, E. D. C. 633.912 : 632.951.8  
**Palm oil diluent for tar oil fungicides and its effects on bark renewal of *Hevea*.**

*J. Rubb. Res. Inst. Malaya*, 1939, 9 : 40-50.

An experiment is described in which the benefits of using controlled quantities of palm oil as a diluent for fungicides for application to the tapped panel of rubber trees are demonstrated. In the case of old hard-barked rubber trees the subsequent renewal of bark was greatly improved. The factors responsible are thought to be a hormone factor promoting cambial activity and growth and a physical factor, the prevention of excessive evaporation of moisture from the inner cortex exposed by tapping. Investigations on these lines are proceeding. It is not shown that the renewal of bark of young vigorous trees will be stimulated.



1426. VOLKHOVSKAYA, U. V. 633.913  
**Golden-rod (*Solidago*). Results of introduction.** [Russian, English summary.]  
*Trud. Introd. Nurs. subtr. Cult. Sukhum*, No. 8, 1937, pp. 41.

Trials in U.S.A. have shown that species of *Solidago* are promising rubber-producing plants. In the collection at Sukhum great diversity of morphological characters and of rubber content is exhibited. Clones with a high yield of green matter and rubber are being selected. The percentage of rubber varies from 0.8% to 6.4% and the yield of single plants from 5.15 g. to 25.5 g. amounting to from 250-500 kg. per hectare of a 2-year-old plantation. The best clones are from *S. sempervirens*, *S. mexicana*, *S. altissima*, *S. petiolaris*. A simple method of rubber extraction has been evolved. Advantages of this crop are its easy cultivation under a variety of conditions and the rapidity with which it can be propagated.

1427. MESHECHOK, B. I. 633.913  
**Kok-saghyz. (A rubber plant.)** [Russian.]  
 State Publishers White Russia, Minsk., 1938, pp. 66, 0.80 roubles.

1428. TANAKA, T. 634.441-1.541.35  
**A new method in mango propagation.**  
*Commun. hort. Inst. Taihoku, Japan* 79, reprinted in *Philipp. J. Agric.*, 1939,  
 10 : 1-7, 9, and *Proc. agric. Soc. Trin. Tob.*,\* 1939, 39 : 232-8.

The method described is simply a greenwood side graft in which the wood of the stock for preference and of the scion always is immature. The scion wood is unpetioled, the leaves having been cut off some days before. The stock is young seedling material. Older stocks (10-15 cm. diameter) and trees can be topworked by this method by grafting on the vigorous shoots that arise after the stock or tree has been headed back. The stock is cut 5-10 cm. from the ground, leaving 2 or 3 leaves in place. The tie is made with cotton string tape of the kind used in shops and composed of several thread lines pasted flat in one narrow strip. It must be wound close and tight to exclude air and is kept in place until the scion stem begins to swell. Ordinary waxed budding tape is not satisfactory as it has not sufficient give. No graft cover is needed even in strong sunlight. The success of the graft before growth starts can be gauged with the aid of an electric torch at night; if alive and working the scion looks lustrous and turgid. Internal activity can also be detected by the presence of ants on the scion in search of sugar secretion. The top of the stock is removed when the scion reaches a length of 30 cm. but any new shoots which start on the stock must be eliminated as soon as they occur. The best time for grafting is between flushes. Many other directions not differing from common practice are given.

1429. LANUZA, E. A. 634.441 : 581.145  
**Notes on bud differentiation in Carabao mango (*Mangifera indica* L.).**  
*Philipp. J. Agric.*, 1939, 10 : 131-51, bibl. 19.

The article deals with bud differentiation of mango from the point of view of the grower in the Philippines. Smudging to hasten flower production is largely practised and somewhat costly. Among the objects of the study was an attempt to save expense by discovering if possible (a) any signs that might distinguish potential flowering from non-flowering trees and (b) to discover the minimum time in which smudging would take effect. Under (a) nothing definite could be established. Under (b) the investigation was slightly more fruitful. Signs of differentiation occur from 6-17 days after smudging. External signs are a greater radial thickening followed by the development of a beak-like appearance of the bud due to greater growth on one side. At this stage smudging may cease, thereby saving much of the usual cost. It is also shown that the operation of smudging not only forces trees into flower but causes those to flower that would not otherwise do so. In the course of the paper the development of the foliar and floral parts is carefully traced from their initiation. The seven plates contain a great many figures illustrating the development of the various parts of the bud.

\* The five plates in the original, illustrating the article, are here omitted.

1430. BARNELL, E. 581.145.2 : 634.653 + 634.441  
**Studies in tropical fruits. V. Some anatomical aspects of fruit fall in two tropical arboreal plants.**  
*Ann. Bot., Lond.*, 1939, 3 : 77-89, bibl. 5.

The author summarizes his experiments at the Low Temperature Research Station, I.C.T.A., Trinidad, as follows:—The anatomical changes associated with normal fruit-fall are described for the mango (*Mangifera indica*) and avocado (*Persea americana*). Whereas shedding of the fruit stalk is accompanied by the development of an abscission layer as in leaf-fall, the separation of the fruit from its stalk is primarily due to the dissolution of the middle lamellae in the tissues at the base of the fruit. Fruit-fall is therefore a normal phase in the progressive softening and disintegration of tissues during the later stages of ripening. The position of the plane of separation is predetermined both by morphological and anatomical features. Absciss cork formation is evident only at the junction of fruit stalk and leafy stem and develops some time after fruit-fall has taken place.

1431. FRANSSEN, C. J. H. 634.441-2.6/7  
 Een voorloopig beknopt overzicht van de plagen van de mangga. (**Pests of the mango tree in the Dutch East Indies.**) [English summary 1 p.]  
*Meded. alg. Proefst. Landb.* 31, 1938, pp. 23, bibl. 16, being *Meded. Inst. PlZiekt.* 91, fl. 0.45.

The pests attacking the mango in the Dutch East Indies are briefly discussed and suggestions given for their control where it is practicable.

1432. HUTSON, J. C. 632.77 : 634.3 + 634.441  
**Some suggestions for the control of the citrus and mango fruit fly (*Dacus ferrugineus*).**  
*Trop. Agriculturist*, 1939, 92 : 281-7.

The fruit fly can be controlled if taken in time. 10 drops of citronella oil in jam jars two-thirds full of water are attractive only to male flies. They are, however, useful in determining the moment at which to take effective measures. This is when the number of male fruit flies per jar rises to over a dozen in two or three successive weeks. A successful bait is either sodium silico-fluoride powder or lead arsenate powder 2 oz., cheap sugar 2 lb., water 4 galls., hung up in the trees in cigarette tins. Six vertical cuts 1 inch deep are made at intervals down the top edge of each tin and alternate pieces between the cuts are bent outwards to form horizontal flaps; the lid is replaced and in the gaps are inserted wicks of cloth or lamp-wicks, one end being in the solution and the other projecting about one inch beyond the edge of each flap. The flies feed from the wicks but die elsewhere. One tin per tree at the rate of 24 trees per acre is considered enough. This is a more effective method than sprinkling, which is also described. The best time to start baiting in Ceylon is 6 weeks before the first fruits ripen. Bagging is an effective method of prevention of attack but does not control the fly. Attacked and fallen fruit must be collected and destroyed daily.

1433. LANUZA, E. A. 634.5  
**The pili nut in the Bicol region.**  
*Philipp. J. Agric.*, 1939, 10 : 21-31, 33, bibl. 6.

The pili nut of the Philippines (*Canarium ovatum* Engl. and *C. luzonicum* (Blume) Gray), is an indigenous tree bearing a nut which has a small market locally and abroad. It is scarcely cultivated and the object of the paper is to show that a profitable crop is being neglected. The wood gum has also a value in the manufacture of certain varnishes and medicaments. The climate suiting the tree is tropical, fairly humid and with an evenly distributed rainfall, altitude from sea level to 1,200 feet. Pests and diseases are at present negligible. A number of ways of preparing the nuts for home use or marketing are given.

1434. BURRET, M. 634.6  
Afrikanische Palmen als Nutzpflanzen. (African palms and their economic uses.)  
*Tropenpflanzer*, 1939, 42: 185-211, bibl. 29.

The author has previously described the palms of Brazil and their economic uses (see *H.A.*, 9:295). In this article he deals with a large number of palms which are either native to Africa or have become well established there. *Cocos nucifera*, economic uses of which are largely known, is merely mentioned and comparatively little space is given to *Phoenix dactylifera*, possibly for the same reason. Detailed accounts are given of *Elaeis guineensis*, *Raphia pedunculata*, *Borassus aethiopicum*, *Phoenix reclinata*, *Chamaerops humilis*, *Eremospatha macrocarpa*, *Hyphaene* and *Calamus* palms, producing oil, fibre, timber, cane, artificial horse-hair and other useful materials. Notes are given on the use of certain palm products by the natives, e.g. palm juice for making palm wine, the use of *Raphia pedunculata* seed as fish poison, etc.

1435. VAN DER VECHT, J. 634.61-2.78  
De bestrijding van de klapperrups, *Artona* (*Brachartona*) *catoxantha*, door bespuiting met derris-suspensies. (Control of the coconut zygaenid moth by spraying with aqueous derris suspensions.) [English summary 3 pp.]  
*Landbouw*, 1939, 15: 389-428, bibl. 7.

The *Artona* coconut moth has been controlled in Java by spraying with derris suspension containing 0.3% derris (rotenone content 10%) and 1½% talc. The machines used are portable pressure sprayers, the nozzle being on the end of a 60-foot rubber tube. One native climbs the tree with the nozzle and sprays the underside of the leaves while the other remains below and attends to the pressure. About 9 litres per tree is required and 15-20 trees per day per machine are treated. Further study is required on the factors influencing the density of *Artona* population under normal conditions and, in outbreaks, the possibility of increasing the number of trees treated per gang per day and the prolonging of the period of toxicity of the spray residue.

1436. NIXON, R. W., AND GARDNER, F. E. 577.15.04: 634.62: 581.145.1  
Effect of certain growth substances on inflorescences of dates.  
*Bot. Gaz.*, 1939, 100: 868-71, bibl. 5.

Attempts to influence the course of development of the ovaries of date palms in U.S.A. by the use of plant growth substances were not successful. They did, however, in particular naphthaleneacetic acid, delay senescence and the abscission of various plant organs.

1437. MITCHELL, J. H. 634.771-1.533.1  
Selecting the deep sucker in banana culture.  
*Qd agric. J.*, 1939, 51: 105.

The corm of a banana produces at least two rings of suckers one below the other but both within a few inches of the surface. Suckers from these buds develop mature foliage too early and the corm rises above soil level, preventing the proper formation of roots. The correct follower is situated at the base of the corm and starts into growth when the parent plant is about three-quarters grown. This deep follower has more vitality, its roots are deeper and it retains its sword leaves longer than shallow suckers. If the suckers are planted with the side of severance downhill the correct follower will invariably appear just where it is wanted, i.e. uphill.

1438. MACLUSKIE, H. 634.774-1.53  
Pineapple propagation. A new method in Sierra Leone.  
*Trop. Agriculture, Trin.*, 1939, 16: 192.

Walters' method of propagating from cross sections or discs of the stem of unfruited pineapples proved unsuccessful in the poor soil at Newton, Sierra Leone. As a result the following method was tried with good results. The stem was stripped and cleaned in the usual way and cut longitudinally into quarter slices. The inner surface was pared flat and the slices, inner surface downwards, pressed halfway into nursery bed humus and well-forked soil. In one week the

\* Walters, E. A. *Trop. Agriculture, Trin.*, 1932, 9: 35-7, *H.A.*, 2: 61, or *Tech. Commun. imp. Bur. Hort. Plant. Crops* 7, 1936, pp. 19-29, 2s.



stronger buds had swelled and in three weeks had become small plants, which in four to eight weeks were well rooted and large enough to cut away with a portion of the parent slice. The slices were replaced for further bud development. Nursery treatment is necessary until the detached plants are strong enough for the field. The most suitable stems are those just about to flower. The Queen averaged 17 (max. 25) plants per stem and the difficult Smooth Cayenne and Baron de Rothschild 5 (max. 8) per stem. Soaking in weak permanganate of potash, as done in St. Lucia [2.5% for 10 minutes.—ED.], will deter ants.

1439. JEPSON, W. F., AND WICHE, P. O. 634.774-2.752  
**Pineapple wilt in Mauritius.**

*Gen. Ser. Bull. Mauritius Dep. Agric.* 47, 1939, pp. 15, 25 cents.

In Mauritius the pineapple wilt was found to be caused by the mealy bug, *Pseudococcus brevipes*. Wilt symptoms in summer varied from those in winter. A number of insecticides which give a satisfactory control of the mealy bug are described. Supplementary control measures consist of selection and treatment with oil emulsions of all plant material, careful weeding and biological control by *Cryptolaemus montrouzieri*.

1440. CARTER, W. 634.774-2.8  
**Geographical distribution of yellow spot of pineapples.**  
Reprinted from *Phytopathology*, 1939, 29 : 285-7, being *Tech. Pap. Pineapple Exp. Stat.* 99.

In the pineapple growing area around Bathurst, Union of South Africa, the occurrence of *Frankliniella schultzei*, an important vector of so-called Kromnek disease of tobacco, was associated with the incidence of pineapple yellow spot.

1441. GROSZMANN, H. M. 634.774-1.521  
**Pineapple plant selection. With special reference to the elimination of inferior types.**  
*Qd agric. J.*, 1939, 52 : 27-42.

Unsatisfactory types of pineapple which should be avoided when selecting planting material are described and illustrated. They include high stemmed plants with the suckers set high, winter fruiting plants in general, plants with slips rising from the base of the fruit itself, plants with long fruits, dry fruits and bottle-necked fruits. Those multiple crowns should be avoided which have a wide junction with the fruit and are associated with flattening of the fruit and its core.

1442. GEHLSSEN, C. A. 635.1/7  
**Gemüsebau in tropischen und subtropischen Gebieten. (Vegetable growing in tropical and subtropical regions.)**  
*Tropenpflanzer*, 1939, 42 : 157-61.

The author surveys usefully the possibility of European vegetable growing in the tropics and sub-tropics with hints on cultivation, manuring, etc. He notes that three crops in a year are possible and suggests a number of successions of 3 crops which might profitably be used, e.g. lettuce (6-8 weeks), beans (10 weeks), kohlrabi (14 weeks) ; or lettuce, cucumber (18-20 weeks) and endives (10-12 weeks).

#### STORAGE.

1443. JOHANSSON, E. 577.16 : 634 + 635  
**Bestämningar av askorbinsyrehalten hos frukt och fruktprodukter vissa köksväxter samt andra växtarter. (The vitamin C content of certain fruits and vegetables.)** [English summary 5 pp.].  
*Medd. Statens Trädgårdsförsök* 4, being *Arsskr. Alnarps Landtbr.-o. Mej. Inst.* 1939, pp. 53, bibl. 22.

Determinations were made in Sweden of the ascorbic acid content of a great number of different fruits, vegetables, soft fruits and fruit products. Nearly all the material analysed was grown at Alnarp. The following notes are taken from the author's summary :—*Apples*. Early varieties

had a lower ascorbic acid content than late varieties. White Winter Calville was the best vitamin C carrier (3-year average being 50 mg. per 100 g.). The top coloured halves of apples contained more vitamin C than the lower halves. Apples stored at 2-4° C. lost little of their vitamin C content. *Pears*. Most varieties contained less vitamin C (5-16 mg.) than apples. Triploid varieties were higher in vitamin C than diploids. *Plums*. Contained 2.5 to 10 mg. per 100 g. *Cherries*. Only few varieties were investigated. They contained 10-20 mg. per 100 g. *Red currants* contained 30-64 mg. per 100 g. Most *gooseberries* contained 20-30 mg. vitamin C. The values for *raspberries* varied from 31 to 47 mg. per 100 g., and the mean value for 7 *strawberry* varieties was 62 mg. per 100 g. *Hips* of certain species of rose gave the highest values of all the fruits analysed, viz. 2 g. per 100 g. *Cotoneaster*. Fruits of 12 species were analysed. The vitamin C values ranged between 12 mg. and 46 mg. The values for the fruits of *Crataegus* varied between 19 mg. and 41 mg. *Sorbus Aucuparia* gave 73.5 mg., *S. Aucuparia moravica* 72.6 mg. and *S. Aucuparia Meinichii* 38.3 mg. *Berberis aggregata* contained 279 mg. at an early stage of maturity. Analytical values are given for the fruits of a number of other trees, shrubs and vegetables, including potato, tomato, radish, cucumber, melon and lettuce, the highest for vegetables being for a tetraploid tomato variety (46 mg. per 100 g.). Of the *fruit products* bottled apples contained 9-13 mg. per 100 g., bottled strawberries 22 mg. and black currant jam 38 mg. per 100 g.

1444. KROKER, K. 664.85.037 + 664.84.037 : 577.16  
Der Einfluss der Aufbewahrung und der Gefrierkonservierung auf den  
Vitamingehalt von Obst und Gemüse. (The effect of ordinary and cold  
storage on vitamin content in fruit and vegetables.)  
*Forschungsdienst*, 1939, 7 : 619-40, bibl. 131.

Practically no loss of vitamin A occurs during a short storage of fruits and vegetables at room temperatures. At lower temperatures the loss is even smaller and in frozen vegetable foodstuffs vitamin A content is almost as high as in fresh vegetables and fruits. Vitamin D and vitamin E remain fairly constant in storage and cold storage. Vitamin B complex does not fall after several months of storage or freezing of the vegetable product, in fact rice can be stored for several years without much of this vitamin being lost. Vitamin C is extremely sensitive to storage. It remains fairly constant in acid vegetables and fruits even at room temperature, but is destroyed very rapidly in vegetable products, the cell juice of which has a high pH, and which are exposed to the action of oxygen. Such vegetables and fruits as can be preserved by freezing at very low temperatures such as -18° C. not only retain their flavour, colour and aroma, but also their vitamin C content, provided they are used at once or soon after thawing. The large number of references should be noted.

1445. PAECH, K. 664.84.037 + 664.85.037 : 577.16  
Die Veränderung des Vitamin-C-Gehaltes bei der Kaltlagerung und beim  
Gefrieren von Obst und Gemüse. (Cold storage and freezing as affecting  
vitamin C content in fruit and vegetables.)  
*Forschungsdienst*, 1939, 7 : 391-411, bibl. 32.

A study was made at Karlsruhe of the effect of cold storage and freezing on vitamin C content in vegetables and fruits. The following notes are taken from the summary :—Determinations were made at regular intervals of the vitamin C content in young French beans and red currants stored in darkness at different temperatures within the ranges +30° C. and +0° C. The titration method was used. The vitamin C content loss of the beans was apparently dependent on the temperatures during the first 80 to 100 hours. Later on the differences levelled out. At 0° C. the loss of vitamin C was considerably less than at any other temperature above 0° C. Currants lost 20% vitamin during the first day after picking regardless of the temperatures at which they were held, but once reduced the amount of vitamin C remained undiminished at all temperatures till the berries were no more fit for eating. There is a relatively small loss of vitamin C during bleaching. The vitamin C content of bleached products does not decrease during the freezing process. Raw vegetables, however, seem to lose up to 40% of the reduced ascorbic acid. Fruit

receiving no treatment prior to freezing does not show a fall of vitamin C content during freezing or subsequent storage at  $-20^{\circ}\text{C}$ . Vegetables that have been satisfactorily bleached keep their vitamin C content during storage at below  $-15^{\circ}\text{C}$ . Among the vegetables examined spinach was an exception. Bleached vegetables also lose most of the reduced ascorbic acid when they are stored at higher temperatures ( $-8^{\circ}\text{C}$ ). Vegetables frozen in the raw state show a decrease in vitamin C content at all temperatures. Only a very slight loss of vitamin C occurs when frozen vegetables are boiled. Frozen fruit retains after thawing practically all of its vitamin C content with the exception of strawberries and tomatoes.

1446. MACLINN, W. A., AND FELLERS, C. R. 635.64 : 577.16

**Ascorbic acid (vitamin C) in tomatoes and tomato products.**

*Bull. Mass. agric. Exp. Stat.* **354**, 1938, pp. 39, bibl. 109.

Recent investigations in the United States led to the following conclusions:—Tomato varieties and strains showed a considerable range in ascorbic acid content (74 to 249 international units per ounce). The possibility that ascorbic acid content may be an inherited characteristic is indicated. The outside flesh and skin of the fruit were found to contain most of the ascorbic acid, but its highest concentration was in the seeds and in the gelatinous material of the locule section. Neither fruit size nor degree of ripeness had any influence on the ascorbic acid content. The use of parchment wrappers did not result in the fall of ascorbic acid content of tomatoes when they were held for ten days in cold storage or at room temperature. 25% of the original ascorbic acid present in tomato juice was destroyed when the juice was concentrated in order to prevent separation of suspended solids. Tomato juice stored for 400 days both in the dark and in the light did not lose more than 25% ascorbic acid. The carotene (vitamin A) content of canned or bottled tomato juice was not seriously affected by ordinary storage for a few months. Commercial brands of tomato juice contained 40 to 100 international units of ascorbic acid per ounce. The variation within one brand was from 28 to 85 units per ounce.

1447. HARDING, P. L., WINSTON, J. R., AND FISHER, D. F. 634.31 : 577.16

**Seasonal changes in the ascorbic acid content of juice of Florida oranges.**

*Proc. Amer. Soc. hort. Sci. for 1938*, 1939, **36** : 358-69, bibl. 23.

The ascorbic acid content of early and mid-season orange varieties and Valencia Late is the same. There was a general decrease in ascorbic acid with ripening in Valencia oranges. Oranges grown on rough lemon had a smaller ascorbic acid content than oranges on sour orange, grapefruit, sweet orange and Cleopatra mandarin rootstocks, on all of which oranges ranged about the same in ascorbic acid content. The higher ascorbic acid values came from exposed fruits on the outside of the branches. Individual oranges of a sample showed considerable range in ascorbic acid content, but the range for the whole sample was fairly constant.

1448. ROBINSON, R. E. 664.84 + 664.85

**Household storage of fruits and vegetables.**

*Publ. Canada Dep. Agric.* **632**, 1938, pp. 8, being *Circ.* **138**.

*General.* All fruit and vegetables selected for winter storage should be well grown, fully mature and free from damage caused by insects, disease, rough handling, mechanical injury, freezing and chilling. All specimens should be dry and clean. During the storage period produce should be sorted regularly and defective specimens completely removed from the storage room. Samples of such products as apples, potatoes and turnips should be cut to determine internal injury. Fruits and vegetables affected with internal injury should not be stored. *Apples.* Only such varieties as are known to be suitable for winter storage should be chosen. Separated as to variety, apples should be placed in slatted bushel crates or other containers providing adequate air circulation. Dessert apples should be individually wrapped in shredded oil paper or oil wraps. Temperature should be maintained at  $33^{\circ}$  to  $38^{\circ}\text{F}$ . and humidity at 80-85%. Shrivelling of the fruit indicates low humidity, and the appearance of moulds indicates excessive humidity. Sprinkling of water on the floor of the storage room or a thorough ventilation will adjust the humidity requirements in the storage room. *Potatoes* should be



stored in a dark room with a temperature of 36-38° F. and adequate ventilation. *Onions* should be stored at 33-40° F. in shallow layers on shelves or trays. They need plenty of air. *Cabbage*. Good ventilation is essential. The temperature should be maintained at 33-37° F. *Cauliflower*. The leaves should be retained and heads not allowed to touch. The most satisfactory storage temperature is at 33-40° F. *Celery* requires a storage temperature at 33-38° F. and high humidity (85%). *Tomatoes* picked in a mature green condition should be stored at a temperature of about 50° F. Wrapping tomatoes in paper is advisable. *Beets*, *carrots*, *parsnips*, *salsify* and *turnips* require similar storage conditions to those needed for potatoes. Notes are given also on storage of *squashes*, *pumpkins* and *sweet potatoes*.

1449. ISAAC, W. E., AND BOYES, W. W. 664.85.11

**The cold storage of Rome Beauty and Granny Smith apples.**

*Rep. Low Temp. Res. Stat. Lab., Capetown, for the year June 1936-June 1937*, 1938, pp. 180-4, bibl. 1.

Storage temperatures of 33° F., 35° F. and 38° F. were used. After removal from store apples were transferred to a room at 65° F. for 1-2 weeks. *Rome Beauty*. Considerable superficial scald appeared and, although fungal wastage was small and no physiological disorders of flesh or core were seen, these apples did not keep well, losing firmness and flavour. Tests indicated that storage should not exceed 14 weeks. Temperatures of 33° F. and 35° F. were superior to 38° F. *Granny Smith*. This stored well for long periods and was quite firm and of good flavour after 6 months' storage. It is, however, subject to superficial scald and in these tests most of it occurred before the end of the first 14 weeks in store.

1450. KIDD, F., AND WEST, C. 664.85.11.035.1

**The controlling influence of carbon dioxide. VI. The effect of the tension of oxygen and of carbon dioxide in the atmosphere upon the course of chemical change in stored apples.**

*New Phytol.*, 1939, 38 : 105-22, bibl. 7.

The purpose of the work described here was to study the influence of oxygen and carbon dioxide on the progressive changes in chemical composition which take place during the storage of mature Bramley's Seedling apples. Two temperatures of storage were used, namely 1° C. and 5° C. The methods of analysis are given and the primary chemical data for the flesh are tabulated. The authors summarize as follows:—"Each of the three main fractions of the mature apple, namely, (a) the starch and sugar fraction, (b) the alcohol-insoluble fraction excluding starch, and (c) the acid fraction, in all probability contribute to the loss of carbon in respiration. The tension of both oxygen and of carbon dioxide affects the drain upon each of these fractions. Oxygen tension has little effect upon the rate of cane sugar hydrolysis over the range studied. Carbon dioxide increases the rate of cane sugar hydrolysis but decreases the rate of hydrolysis of the alcohol-insoluble fraction. The results point to the existence of a fructosan in the alcohol-soluble fraction. A comparative study of the starch + sugar fraction indicates that the behaviour of this fraction is anomalous, and that sugar must be both passing into and produced from the undetermined fraction during storage of the fruit. There is a sharp contrast between the behaviour at 1° and 5° C. as regards the alcohol-soluble undetermined fraction. There is a production of fructose units during the hydrolysis of starch which is connected with this process."

1451. KIDD, F., AND WEST, C. 664.85.11.035.1

**Formation of "fructose" units during starch hydrolysis in the later stages of the growth of the apple.**

*New Phytol.*, 1939, 38 : 123, bibl. 3.

Results are given of Archbold's work on chemical composition of Bramley's Seedling apples and of the author's own observations on the rate of CO<sub>2</sub> production of this variety at different stages of growth. The figures indicate that there is no extensive interconversion of "glucose" units to "fructose" units or the reverse except when starch hydrolysis is known to be proceeding. There is then an active conversion of "glucose" to "fructose".

1452. PHILLIPS, W. R. 664.85.11

**Respiration curve for McIntosh apples.**

*Sci. Agric.*, 1939, 19 : 505-9, bibl. 4.

Respiration studies at the Central Experiment Station, Ottawa, on individual McIntosh apples held at 55° F. revealed that the senescent hump phase in respiration occurs at or just previous to the time of harvest. From these and other experiments it appears that McIntosh store better and develop higher quality if this phase is passed on the tree, and that if allowed to pass the climacteric on the tree the apples are much less susceptible to CO<sub>2</sub> or methyl bromide injury.

1453. ISAAC, W. E. 664.85 : 547.476.2

**Further experiments concerning the use of maleic acid as a fruit ripening inhibitor.**

*Rep. Low Temp. Res. Stat. Lab., Capetown, for the year June 1936-June 1937*, 1938, pp. 177-80, bibl. 2.

The author's results agree with those obtained in 1936 (*Ibidem* for 1935-36, H.A. 8 : 1258) but, with regard to the fruit varieties tested, at best they only afford limited confirmation of Copisarow's conclusions that maleic acid retards fruit ripening. Amyl acetate was found to have a very detrimental effect both in disfiguring the skin of most of the apple varieties tested and also in reducing resistance to fungal infection in Rome Beauty and Pearmain apples. The decidedly lower percentage of fungal wastage obtained in 1936 and 1937 by adding maleic acid to amyl acetate is interesting in relation to Copisarow's later claim (*J. Chem. Industr.*, 1936, 55 : 746) that maleic acid-oil emulsions may prove of practical value in increasing the resistance of plants to parasitic attack.

1454. VAN DER PLANK, J. E. 664.85.13

**The storage of Bon Chretien pears.**

*Rep. Low Temp. Res. Stat. Lab., Capetown, for the year June 1936-June 1937*, 1938, pp. 68-75, bibl. 2.

The author summarizes the results of his experiments with Williams pears as follows:—"The effect of the temperature of storage for a period of 24 to 27 days on subsequent ripening at 45° F. and 65° F. was determined. With ripening at 45° F. the previous storage temperature had little effect except in the time taken for scald and breakdown to appear. Fruit which had been stored at 45° F. did not ripen normally at 65° F. Fruit stored at 40° F. also ripened unsatisfactorily at 65° F. Although the majority of fruits attained an eating-ripe stage, the quality was poor and the fruit developed core-breakdown rapidly. All the consignments which were stored were similar in these respects. Fruit stored at 34° F. ripened normally, and remained edible for a longer period. With this storage temperature differences in quality between fruit from various growers were marked. Fruit stored for 24 to 27 days at 34° F. and thereafter conditioned for 3 days at 65° F. ripened normally at 45° F. Differences in keeping quality between the fruit from the various growers were not so pronounced as when the fruit was ripened at 65° F. throughout."

1455. DAVIES, R., BOYES, W. W., AND DE VILLIERS, D. J. R. 664.85.22.037

**Storage of plums.**

*Rep. Low Temp. Res. Stat. Lab., Capetown, for the year June 1936-June 1937*, 1938, pp. 38-53.

A large number of different plum varieties were submitted to storage at 34° F. and at 45° F. for 24 days and then to ripening at 65° F. Three stages of maturity were incorporated in most cases as determined both by colour and by pressure tester. The sample unit consisted of 3 trays of unwrapped single layer fruit, i.e. 150-200 fruits. Plums so tested were Santa Rosa, Wickson, Gaviota, Kelsey, Methley, Beauty, Apple Plum, Satsuma, Chalcot and Formosa. 34° F. was suitable for the following:—Santa Rosa (greenest fruits), Gaviota (some only), Beauty and Formosa. 45° F. was suitable for Santa Rosa, Wickson (greenest fruits), Gaviota, Apple Plum, Satsuma, Chalcot (greenish fruits) and Formosa, the minimum of breakdown

occurring thus. There are indications that a storage temperature of over 45° F. may be best for Wickson. Effects of delayed storage on Santa Rosa were also tested.

1456. SMITH, W. H.

664.85.22 : 632.19

**Physiological breakdown in stored Monarch plums.**

*J. Pomol.*, 1939, 17 : 284-91, bibl. 4.

The effect on physiological breakdown of storage temperature, duration of storage and degree of maturity at picking in Monarch plums at the Ditton Laboratory, East Malling, is described. Increased maturity at picking advanced in time the first appearance and maximum development of physiological breakdown at each temperature. In early stages the maximum percentage of plums affected was found in the intermediate temperatures. It was very much later at the lower temperature. The minimum percentage of breakdown occurred at 34° F., a rapid rise in the amount of breakdown being found both above and below this temperature. The two types of total physiological breakdown may be distinguished symptomatically as internal browning and jellying. Their causal relations are probably different. Between 34° F. and 45° F. both types of disorder may appear even in the same plum. At and above 45° F. the plums are susceptible only to jellying, the degree of susceptibility falling to nil with rise of temperature, and at 34° F. and below they are susceptible only to the internal browning type, susceptibility increasing rapidly with lowering of temperature.

1457. DAVIES, R., BOYES, W. W., AND DE VILLIERS, D. J. R.

664.85.25

**Storage of peaches.**

*Rep. Low Temp. Res. Stat. Lab., Capetown, for the year June 1936-June 1937*, 1938, pp. 38-53.

Early Dawn gave unsatisfactory results after storage at 45° F. and 34° F. Inkoos stored successfully for 24 days at 31° F. There are indications that it might be successfully ripened at 45° F., though the ultimate quality would probably not be so good as if ripened at 65° F. Duke of York stored best at 31° F. as on previous occasions. Peregrine peaches stored best at 31° F. or lower temperature and thus do not need any precautions to prevent woolliness. At this temperature a stage of maturity representing approximately 6-7 lb. pressure with a 7/16 in. plunger was almost free from bruising and resulted in a very good product. Elberta gave unsatisfactory results in store. Further storage trials at 31° F. and 45° F. combined with trial of delayed storage at the former temperature are indicated as necessary.

1458. WILLISON, R. S.

634.25-2.42 : 664.85.25

**Brown rot\* of peaches in transit and storage.**

*Sci. Agric.*, 1939, 19 : 458-74, bibl. 27.

Many packs of Rochester and Elberta peaches were shipped from the Ontario peach district overland to the Canadian west and overseas to England in the years 1933-37 and were examined on arrival and at intervals afterwards. Duplicate shipments were given corresponding examinations at St. Catharines. The following conclusions were drawn :—While the riper grades of peaches were more susceptible to rot than the green, it was found possible to delay the incidence of rot in the riper grades long enough to permit marketing. For either variety, the later picks were somewhat more susceptible to rot than were the first picks of the season. A number of different forms of wettable sulphur were used in the experiments. In general, those sprays which could be applied immediately before harvest gave more uniform results than those which had to be applied 2 or 3 weeks earlier. Dusting with sulphur was also satisfactory except when rain intervened before harvest. Wastage in the form of bruises and, to a lesser extent, of rots was reduced by careful handling during picking and packing operations. The incidence of rot was usually much higher when peaches were cooled after a delay of 24 hours than when cooled shortly after picking. In the case of shipments in which the car was iced only on departure there was little difference in the development of rot in treated and non-treated peaches. [Author's summary.]

\* *Sclerotinia fructicola* (Wint.), Rehm.



1459. ISAAC, W. E. 664.85.2  
**The evolution of a growth inhibiting substance by ripening peaches and plums.**  
*Rep. Low Temp. Res. Stat. Lab., Capetown, for the year June 1936-June 1937,*  
 1938, pp. 172-6.

Tests\* were carried out with Inkoos, Peregrine and Elberta peaches and with Santa Rosa and Wickson plums and with seedlings of the Canadian Wonder bean (*Phaseolus vulgaris*), sunflower (*Helianthus annuus*) and broad bean (*Vicia Faba*). Under laboratory conditions air previously drawn over ripening fruits of the above plums induced the following responses in the seedlings:—retardation of growth in length, increased growth in thickness, changed growth response to external physical factors. Potato sprouts also showed a marked decrease of growth in length and increase of growth in thickness. These results are precisely those known to be induced by minute amounts of ethylene. They were very marked and positive except in the case of Kelsey plums, where they were positive but less pronounced.

1460. LOUCKS, K. W. 664.85.8.037  
**Cold storage prolongs marketing period for Florida grapes.**  
*Pr. Bull. Fla agric. Exp. Stat.* 530, 1939, pp. 2.

The following hints are given on commercial storage of grapes in Florida. The temperatures should be within the range 29° F. to 32° F. and relative humidity high [not stated]. The fruit should be mature and free from disease. It should be handled carefully to avoid bruising, and should not be stored in containers over eight inches deep. The fruit should be placed in cold storage immediately after harvesting. The storage room must be clean and free from all materials from which the grapes can absorb objectionable flavour. After removal from cold storage the fruit should be kept for several days in a moist atmosphere.

1461. ABBOTT, O. D., AND LOUCKS, K. W. 634.8 : 664.85.8  
**Utilization and storage of Florida grapes.**  
*Bull. Fla agric. Exp. Stat.* 329, 1938, pp. 14.

None of the Florida grape varieties tested contained sufficient pectin for use in commercial jelly making. They showed the greatest promise in the preparation of unfermented juices, some of which were of excellent quality. At a storage temperature of 32° F. very few grapes were discarded because of fungus infection, but shelling and shrivelling occurred. Storing the grapes for about 30 days at 37° F. gave satisfactory results. There are indications that cold storage of grapes in a commercial ice-cooled store for some 60 days is economically possible, if the fruit can be used quickly after removal. SO<sub>2</sub> treatment before storage delayed deterioration of stored grapes for about 30 days, but the loss from fungus infection of treated fruits was then more serious than that of untreated fruits. The keeping quality of the grapes could not be improved by any of the chemical treatments tried. Grapefruit juice diluted with 4 parts of water was effective in removing spray residue from grapes.

1462. REYNEKE, J., AND DU PLESSIS, S. J. 664.85.8  
**The cause and control of wastage in grapes.**  
*Fmg S. Afr.*, 1939, 14 : 64-6, 68, bibl. 4.

Of a number of substances used in combination with different methods of packing 10 grains of powdered potassium meta-bisulphide added to the woodwool of waxed paper-lined boxes proved the best means of preventing botrytis wastage and dry stalk in grapes. It was similarly effective in ordinary packs when added to the woodwool in the form of a solution of alcoholic suspension and in waxed papers of individual bunches as 1 or 2 crystals. Fumigation in a 4% formalin atmosphere was satisfactory only with ordinary woodwool packs and not with paper-lined boxes. It did not materially benefit the stalk. The method is not likely to be useful with grapes from dry areas. Spraying woodwool or waxed wrappers with formalin solutions was very ineffective.

\* For a fuller account see *Trans. roy. Soc. S. Afr.*, 1938, 26 : 307.

1463. RATTRAY, J. M. 664.85.8 : 632.4  
**Grape wastage investigations, 1937.**  
*Rep. Low Temp. Res. Stat. Lab., Capetown, for the year June 1936-June 1937,*  
 1938, pp. 75-91.

As the result of 2 seasons' experiments on Gros Colman grapes from Constantia the author concludes that the general tendency is for waste of grapes to increase with maturity. Although this tendency is shown in successive pickings, in the individual consignments of each grower and in green and ripe stages picked at the same time, there appears to be no relationship between grower and grower as regards total soluble solids-acid ratio and waste. The experiments indicate that the effect of trimming bunches is hardly of commercial importance. Experiments, were not able to point to any definite period of delay between rain and picking being expedient, the problem rather being how to forecast the development of a botrytis infestation by studying the weather. Experiments were made, on the whole without great success, on the use of different wrappers, i.e. sulphite wrappers untreated, and ditto treated with ortho-phenyl-phenol, of dipping in alcohol (95%) and acetic acid (4%), and of fumigation with formaldehyde.

1464. BEYERS, E. 664.85.8 : 632.19  
**Drop berry and desiccation of stalks in Waltham Cross grapes.**  
*Rep. Low Temp. Res. Stat. Lab., Capetown, for the year June 1936-June 1937,*  
 1938, pp. 91-101.

Experiments at Paarl indicate that berry drop can be best checked by prompt cooling and—previously—by provision of adequate soil moisture. Otherwise weather conditions and unknown soil factors have the greatest influence on drop. There is, however, evidence that picking under cool conditions tends to check it. As regards stalk desiccation all factors affecting evaporation of moisture are important, which means all measures affecting the incidence of drop.

1465. RATTRAY, J. M. 664.85 : 635.61  
**Melon storage investigations 1937.**  
*Rep. Low Temp. Res. Stat. Lab., Capetown, for the year June 1936-June 1937,*  
 1938, pp. 112-22.

The honeydew melon from the Stellenbosch area was the material used. The melons were stored at 3 stages of maturity at 45°, 55°, 65° and 80° F. for 25 days and then removed to 50° for 10 days. 65° F. resulted in least waste and at this temperature the stage of ripeness at storing did not affect keeping quality. Melons stored at 65° F. kept for longer at a post-storage temperature of 50° F. than those stored at other temperatures. Experiments with fungicides indicated that surface sterilization of fruit does not stop mould development and that primary infections appear therefore to be latent. These infections have more chance of developing at low temperatures. A trial of different wrappers at 45° F. and 65° F., namely waxed crystalline paper, non-moisture-proof cellophane paper and plain sulphite paper gave results slightly favouring the use of sulphite paper and again definitely showing the superiority of 65° F. as regards amount of wastage.

1466. VAN DER PLANK, J. E., RATTRAY, J. M., BOYES, W. W., AND  
 DE VILLIERS, D. J. R. 664.85.31  
**The effect of temperature of storage on navel oranges.**  
*Rep. Low Temp. Res. Stat. Lab., Capetown, for the year June 1936-June 1937,*  
 1938, pp. 122-38, bibl. 2.

The material used was navel oranges from 5 packhouses in different localities, of standard export quality and not especially treated. The storage temperatures used were 39° F., 45°, 50° and 55° F., the time in store varying from 24-31 days. At 35° F. skin blemishes were very frequent and there were no counterbalancing advantages. 39° F. and 45° F. are indicated as desirable temperatures when there is a tendency to waste or when fruit is fully ripe. 50° F. and 55° F. are indicated when fruit is greenish or undercoloured, hard, lacking in maturity, or having a

tendency to storage blemish. When fruit is of bad keeping quality these temperatures increase waste but with good fruit the waste is as low as at 39° F. and 45° F. Observations and in some cases tentative recommendations are made with regard to the fruit from the different districts.

1467. VAN DER PLANK, J. E., RATTRAY, J. M., BOYES, W. W., AND DE VILLIERS, D. J. R. 664.85.31

**The storage of navel oranges for a period of about 60 days.**

*Rep. Low Temp. Res. Stat. Lab., Capetown, for the year June 1936-June 1937, 1938, pp. 139-43, bibl. 1.*

The accumulation of waste in store was steady, and fruit which stored well for a period of about one month also stored quite well if the period was extended to about two months. But fruit which showed high waste after about one month became very wasty when the storage period was prolonged. Fruit stored at 50° F. for about two months was very prone to become stale, but at 39° F. the flavour was maintained well, except in the case of fruit which was picked at an advanced stage of ripeness. In several brands of fruit there was considerable blemishing at 39° F. after two months' storage. [Authors' summary.]

1468. VAN DER PLANK, J. E., RATTRAY, J. M., BOYES, W. W., AND DE VILLIERS, D. J. R. 664.85.3.037

**The effect of fast cooling and under-cooling of navel oranges.**

*Rep. Low Temp. Res. Stat. Lab., Capetown, for the year June 1936-June 1937, 1938, pp. 143-5.*

Boxes were cooled by air delivered at 33° F. at a velocity of about 30 lin. ft. per min. Under-cooling was deliberately practised and the boxes were not removed until fruit temperatures had dropped to 35° F. They were then removed to storage at a temperature of 45° F. As a control the same amount of fruit from the same consignment was stored in the same room at 45° F. without previous treatment. As regards storage blemishes there was on the average a slight, insignificant bias in favour of fast cooling and under-cooling, but as in the case of waste the greatest differences were found as between consignments and not treatments. No differences were detected in flavour, colour or texture of flesh.

1469. VAN DER PLANK, J. E., RATTRAY, J. M., BOYES, W. W., AND DE VILLIERS, D. J. R. 664.85.3.037

**The effect of pre-storage heating of navel oranges.**

*Rep. Low Temp. Res. Stat. Lab., Capetown, for the year June 1936-June 1937, 1938, pp. 145-7, bibl. 1.*

Boxes of navel oranges were kept in a room at 80° F. for 26-30 hours. The air was maintained at 90% relative humidity and was continuously stirred by a fan to ensure circulation between the fruits. Condensation resulted and the wraps became damp and clammy. The boxes were then stored at 39° F. for 24-31 days. Finally the fruit was compared with fruit merely kept at 39° F. for the same period in the same room. There was no significant difference in wastage between the two lots, though it is thought that there might well have been, if the fruit had not been of fairly good keeping quality. Storage blemishes were less in all samples of the heated fruit.

1470. HYATT, J. B., AND KEYS, O. H. 634.334-1.56

**The curing and colouring of New Zealand lemons.**

*N.Z. J. Sci. Tech., 1939, 20 : 318B-40B, bibl. 6.*

Curing experiments with New Zealand-grown lemons, starting from the green or silver stage, indicate that curing for four to six weeks should result (on the average) in a 25% decrease in peel thickness, a 25 to 35% increase in juice percentage, a 10-15% increase in total juice yield (juice per lemon), and also an increase of citric acid, vitamin C and total solids in the juice. It has been shown that these changes are accelerated by a gassing treatment, which also confers a satisfactory colour after about one week. At the humidity recommended, the fruit shrinks by some 10 to 15%, but not at the expense of the juice content. The effects are somewhat variable owing to seasonal or other influences. Coal-gas (1 : 1,000) appears to be a suitable



source of ethylene. The detrimental effects of relatively low humidity over any part of the curing period are emphasized. The conditions recommended are a temperature of 70° F. and a relative humidity of 90 %, with gas for the first week. [Author's summary.]

1471. INTERNATIONAL INSTITUTE OF AGRICULTURE (KALTENBACH, D.)

**Artificial ripening of fruits by acetylene.**

*Mon. Bull. agric. Sci. Pract., Rome, 1939, 30 : 1T-10T, bibl. 13.*

These notes deal with experiments made in different parts of the world on ripening fruits artificially by means of acetylene, often in comparison with ethylene. Work in the U.S.A., notably that by Hartshorn, Denny, Harvey and the Bureau of Plant Industry, is discussed and in addition experiments in 1936 at the Turin Research Station in Italy are referred to in greater detail. For bananas acetylene was found to be inferior to ethylene with regard to total sugars after treatment. Three years' trials at the Marrakech Station (*La terre marocaine*, Janvier 1938) indicated that, given certain precautions, tomatoes can be put on the market 10 days earlier in excellent condition by treating with acetylene. Dreyer's successful work with Kelsey plums in South Africa is noted. Comparison with ethylene suggests that acetylene has a selective action on the chlorophyll pigment, which is consequently decolorized, allowing carotene and other pigments to become evident. Acetylene treatment tends to shorten the period of weak activity which generally occurs at the start of the ripening process. To obtain the same results as ethylene it must be used at greater concentration. Both gases have a bad effect on storage life, especially ethylene. On the whole, for ripening purposes there is little to choose between the two. The smell of acetylene is, however, a disadvantage as it is liable to communicate a bad taste to the fruit and there is possibly more danger of explosion with it when mixed with air. Opinion on the comparative economics of using acetylene or ethylene varies, South African trials indicating that the lower cost of the former does not compensate for the larger quantity needed. The same experiments also suggest that its effect may be due to impurities—an opinion expressed previously by Denny in U.S.A.—and cannot therefore be predicted with certainty, but this suggestion is not supported by other workers in U.S.A. or by results with pure acetylene in Italy.

1472. WARDLAW, C. W., AND LEONARD, E. R.

664.85.323

**Storage investigations with Trinidad grapefruit 1938-39.**

*Trop. Agriculture, Trin., 1939, 16 : 208-15, bibl. 8.*

Oleocellosis (gooseflesh blemishing) of grapefruit can be reduced if care is taken not to pick the fruit when in a highly turgid condition, thus during the wet season attention must be paid to the time of picking. It is recommended that in wet weather picking should not begin until 10 a.m. The duration of quailing is less important than the time of picking. The satisfactory control of wastage by expeditious handling and rapid cooling to 45° F. has again been demonstrated. As regards rapid cooling it is pointed out that to avoid risk of chilling no grapefruit should be exposed to air at a temperature of less than 40° F., and that, as soon as the fruit in the crates which cool quickest reaches a temperature of 45° F., the delivery air temperature must be raised. Under Trinidad conditions this would occur within 12-15 hours. The borax treatment has been found to stimulate latent infections of *Colletotrichum gloeosporioides*, and since the pathogens which it does control are unimportant in Trinidad, it should be discontinued. Ethylene treatment gives some control of *Botryodiplodia Theobromae*.

1473. VAN DER PLANK, J. E., RATTRAY, J. M., BOYES, W. W., AND DE VILLIERS, D. J. R.

664.85.323

**The effect of temperature of storage on Marsh grapefruit.**

*Rep. Low Temp. Res. Stat. Lab., Capetown, for the year June 1936-June 1937, 1938, pp. 147-50.*

Experiments were carried out on normal standard export quality grapefruit. Storage temperatures were 39°, 45°, 50° and 55° F. for 26-35 days followed by 65° F. for 10 days prior to examination. Results indicate that for complete insurance against cold injury the temperature should be as high as 50° to 55° F. and, moreover, that these temperatures do not increase waste. In

the early part of the season storage at these high temperatures benefits flavour and texture. At the end of the season there is less danger of cold injury and more of staleness of flavour and appearance due to high temperatures. Hence it may be advisable to adopt a sliding scale of temperatures which will be high early in the season and drop later.

1474. VAN DER PLANK, J. E. 664.85.323

**Delayed storage of Marsh grapefruit.**

*Rep. Low Temp. Res. Stat. Lab., Capetown, for the year June 1936-June 1937, 1938, pp. 154-8, bibl. 7.*

The results of delayed storage, which are found to be complicated, are shown graphically. Three factors are involved, namely a beneficial factor operating at the early stages, a detrimental factor which causes injury to rise after the optimum period of delay, and a humidity factor, which is more probably connected with the water content of the fruit than with the humidity of the atmosphere *per se*. The effects of subsequent storage temperature on the results are also noticeable. The results of delayed storage thus are manifest not only in primary susceptibility, but also in the rate at which this susceptibility becomes visible. There is in this respect a striking analogy between delayed storage and ripening on the tree. This feature is discussed.

1475. VAN DER PLANK, J. E. 664.85.323 : 632.19

**1. The different forms of cold injury of Marsh grapefruit and navel oranges : and the modifying effect on them of varying temperatures of storage. II. Some storage blemishes of oranges which are not due to cold injury.**

*Rep. Low Temp. Res. Stat. Lab., Capetown, for the year June 1936-June 1937, 1938, pp. 159-69, and 169-71, bibl. 6.*

The author summarizes his experiments on storage injuries of Marsh grapefruit as follows :—  
“The temperature of storage markedly affects the symptoms of cold injury to citrus fruits. The type of lesion characteristic of various storage temperatures is described for Marsh grapefruit and navel oranges. Button browning of navel oranges appears to be a form of cold injury which is particularly common over the range from 39° F. to 45° F. Stylar-end blotching also seems to result from cold injury. Two types of physiological spotting of navel oranges were observed at 50° F. to 55° F. They may be akin to ‘brown spot’.”

1476. WARDLAW, C. W., AND LEONARD, E. R. 664.85.771

**Studies in tropical fruits. IV. Methods in the investigation of respiration with special reference to the banana.**

*Ann. Bot., Lond., 1939, 3 : 27-42, bibl. 10.*

The view is advanced that respiration studies should be conducted on as comprehensive a basis as possible. Measurements of the internal concentration of carbon dioxide and of oxygen and also of the amounts of carbon dioxide contained in the tissues, are considered essential adjuncts to the measurement of the rate of carbon dioxide liberated at the surface of the fruit, especially where changes in this rate are taking place. Methods and apparatus are described, with special reference to the banana, for the measurement of (i) respiration rate, (ii) internal gas concentrations, (iii) pneumatic pressure within fruits and (iv) tissue content of carbon dioxide. Methods whereby observations may be made on gradients of gaseous concentration and on temperature changes during ripening are also described. In each instance, the advantages and limitations of the methods described are discussed, and their applicability to other fruits indicated. [Authors' summary.]

1477. LEONARD, E. R. 664.85.77

**Banana transport : A comparison of storage conditions in a modern ship and in earlier types.**

*Trop. Agriculture, Trin., 1939, 16 : 200-2, bibl. 4.*

The modern storage conditions on a banana ship differ from the earlier by the subdivision of the storage space into 8 separately refrigerated chambers of 4,000-7,600 cu. ft. capacity, thus enabling

the ship to pick up fruit at a number of ports ; very rapid cooling obtained by an increased size of cooler, which has reduced certain types of storage rots to minor importance ; a constant atmosphere which reduces the carbon dioxide concentration to very low values, a factor which is desirable in so far as it may be taken as an indication of the concentration of other gases, in particular those volatiles known to stimulate ripening.

1478. FERNANDO, M. 663.74-2.78

**The sources of *Ephestia* infestation of stored cacao in Ceylon.**

*Trop. Agriculturist*, 1939, 92 : 141-55, bibl. 14.

The sources of infestation of stored cacao in Ceylon by *Ephestia elutella* Hb., the cacao moth, are shown to be in the warehouses and not on the drying floors of estates and small holdings as is usually supposed. Control measures are the maintenance of perfect cleanliness by frequent sweeping of warehouse floors and whitewashing of walls and ceilings ; spraying warehouse interiors with a solution of pyrethrins in white oil twice a week during moth emergence ; the stacking of sacks of cacao beans on their sides so as to reduce the air space available for pupation and breeding ; lining the sacks with air-dried leaves of *Melia Azadirachta* L. The last method has maintained sacks free from the moth in a heavily infested environment.

1479. SCUPIN, L. 664.85.11.021

Frischhaltung von Äpfeln mit Hilfe bestimmter Öle. (Keeping apples in fresh condition by means of certain oils.)

*Obst- u. Gemüseb.*, 1939, 85 : 48-9.

Experiments in Magdeburg on the preservation of apples (var. Belle de Boskoop and Landsberger Reinette) by coating them immediately after harvesting with certain oils [composition not stated, makers Rhenania—Ossag] led to the following conclusions :—1, treated fruits stored better and were less susceptible to rots than controls ; 2, storage maturity was considerably delayed ; 3, less shrivelling occurred in treated fruits ; 4, treatment had no effect on the occurrence of internal browning ; 5, a similar treatment of overripe fruits was useless.

1480. JONES, S. E., AND RICHEY, H. W. 664.85.11.038 + 635.64 : 631.536

**The use of wax emulsions in reducing desiccation of transplanted tomato plants and apples in storage.**

*Proc. Amer. Soc. hort. Sci. for 1938*, 1939, 36 : 751-3, bibl. 2.

Dipping the tops of tomato plants in 1 : 8 dilution of Dowax wax : water prior to transplanting in hot dry weather was found to reduce desiccation sufficiently to justify field experiments. Applied to apple fruit in cold storage stronger emulsions reduced desiccation but shortened storage life at room temperature. The emulsion also left an objectionable and permanent deposit.

1481. RATTRAY, J. M., AND BEYERS, E. 664.85.8.038

**The use of waxed crystalline paper as a wrapper for grapes.**

*Rep. Low Temp. Res. Stat. Lab., Capetown, for the year June 1936-June 1937*, 1938, pp. 102-12.

Unwaxed crystalline paper was used in early experiments and waxed crystalline paper in the 1936 and 1937 experiments. This material is prepared from a fully bleached glazed transparent grease-proof paper. Several varieties of grape were used. Observations led to the following conclusions :—bunches wrapped in the crystalline paper were fresher than those in the sulphite wrap controls. Their berries were firmer and bloom more obvious. When wastage from mould was slight there was little difference between the two wraps, but when it was more prevalent grapes wrapped in the crystalline paper developed considerably more mould than the control. As a consequence no recommendations can be made for the general adoption of the crystalline type of paper wrapper.



1482. VAN DER PLANK, J. E., AND RATTRAY, J. M. 664.85.3.038  
**The use of waxed and oil-treated citrus wraps and of wax and oil emulsions.**  
*Rep. Low Temp. Res. Stat. Lab., Capetown, for the year June 1936-June 1937,*  
 1938, pp. 151-3, bibl. 5.

The use of commercial lightly-oiled wraps with navel oranges and grapefruit was without effect on the loss of weight of the fruit, on waste or on cold injury. Moisture-retentive waxed crystalline paper reduced loss of weight and pitting of Marsh grapefruit but increased waste due to mould. [Author's summary.]

1483. JOACHIM, A. W. R., AND KANDIAH, S. 664.15  
**Investigations on the keeping quality and storage of kitul (*Caryota urens*) jaggery and treacle.**  
*Trop. Agriculturist*, 1939, 92 : 73-82, bibl. 6.

### PROCESSING AND PLANT PRODUCTS.

1484. CHARLEY, V. L. S. 663.813 + 634.11-1.57  
**Surplus apples in war time.\***  
*Food Manuf.*, 1939, 14 : 342-4.

The bumper production of apples this year once again shows the urgent need in peace time, let alone war, of using the fruit which improved methods of cultivation and increased acreage have produced. Last year was a poor selling year for cider and part of a full cider apple crop this year and the surplus of the dessert and culinary apple crop look like going a-begging. The production of apple juice is limited at present by the storage capacity available and the necessary Boehi tanks are not capable of being procured and installed at short notice. The author considers the following other outlets for the apple harvest. *Concentrated apple juice products.* Apple jelly made by a Kestner evaporator was produced in the last war at Long Ashton. Intermediate degrees of concentration, accompanied by a controlled removal of pectin, result in the production of such materials as apple treacle. The concentration of the juice is another method of utilizing surplus. *Apple butter.* Cruess gives details of two processes for making this product. It is made by boiling the screened fruit pulp with or without the addition of sugar, fruit juices and spices to a semi-solid mass of homogeneous consistency. Notes are given on making three types. *Apple sauces.* These are made by peeling, coring and quartering apples, which are then cooked till soft, a slight addition (20%) of sugar to the pulp generally being made. The sauce is canned hot, sealed and processed. *Apple crisps.* These resemble "rice crispies" in form and consistency. The colour is white and the flavour very true to the fruit concerned. As regards the immediate future the author notes that where mills and presses are available juice could be produced continuously and one moderate sized concentrator, dealing with 150 gall. of juice an hour, would utilize 25 tons of fruit in a 24 hour day.

1485. MARSHALL, R. E., AND KREMER, J. C. 663.813 : 634.11  
**Sterilization of apple juice by flash pasteurization.**  
*Quart. Bull. Mich. agric. Exp. Stat.*, 1937, 20 : 28-34.  
**Further studies on preservation of apple juice by flash pasteurization.**  
*Ibidem*, 1938, 21 : 12-7.

The authors describe and recommend, subject to definite detailed precautions being taken, the process of flash pasteurizing followed by flash cooling apple juice. In brief the process consists of raising the temperature of apple juice from about 50° F. to 190° F. in about 3 seconds by passing it through one unit of the pasteurizer, holding at 190° F. for 2 seconds, then cooling to 115° or 120° in 3 seconds, and filling into bottles sterilized in a calcium hypochlorite solution. The first author has devised a simple sterilizer for the rapid chlorine treatment of bottles by one man.

\* See also Charley, V. L. S. and Harrison, T. H. J. Fruit juices and related products. *Tech. Commun. imp. Bur. Hort. Plant. Crops* 11, 1939, 5s.

1486. DEMORTIER, G., PARMENTIER, A., AND LEMAITRE, R. 663.813  
 Essais de conservation des jus de fruits belges. (**Preservation trials of Belgian fruit juices.**)  
*Bull. Inst. agron. Gembloux*, 1938, **7** : 297-360. [Flemish, French and English summaries.]

The Seitz process of sterilization by filtration is particularly described after a few notes on pre-treatments such as washing, pulping and pressing and clearing. Certain apple varieties are tested and the analyses and various observations on their behaviour during processing are made. Pears, plums, cherries, gooseberries, currants, rhubarb and grapes were also tested, and similar though more condensed information is given about them also. The combination of various juices is also discussed. The outlines of a number of other methods of fruit juice preservation are given.

1487. CHARLEY, V. L. S. 662.3/4 : 663.3  
**Microbiology of fruit in relation to certain fruit products.**  
*Chemistry and Industry*, 1939, **58** : 115-7.

The usual treatment of the apple or other fruit during the process of cider or juice manufacture allows to some extent the development of all the types of organism originally present on the fruit. Important groups, here discussed, are the yeasts, moulds and bacteria, the last divided by the author into (1) acetic organisms, (2) cider sickness bacteria, and (3) ropiness-inducing bacteria. As regards cider making the custom prevalent in Germany of inoculating pure cultures of wine yeasts into centrifuged or pasteurized juice is commended. It may be noted that apple juices extracted from low-nitrogen fruits (from trees grown under grass) ferment at much slower rates than juices from apples off trees grown under clean cultivation. The rate of fermentation greatly influences the ultimate flavour of the cider. Final sterility in cider is now achieved by means of a sterilizing filter, which removes both yeasts and bacteria. Complete control of fermentation can thus be obtained by reception of the filtered produce into sterile vessels. As regards apple juices prevention of fermentation is difficult. Methods used at present are the Boehi process whereby the fresh centrifuged juice is impregnated with 120 lb. pressure of CO<sub>2</sub> per sq. in., or the use of heat to kill the organisms. In the latter method modern pasteurizers use 185-190° F. for half a minute with subsequent rapid cooling to avoid any appreciable cooked taste in the juice.

1488. PULLEY, G. N., AND VON LOESECKE, H. W. 663.815  
**Gases in the commercial handling of citrus juices.**  
*J. industr. engng Chem.* (industrial edition), 1939, **31** : 1275-8, bibl. 7.

Studies were made of the gases present in Florida orange and grapefruit juices after different methods of extraction and de-aeration. Centrifugal de-aeration was found to be the most efficient of the methods examined. The most efficient de-aeration is got when the temperature of the juice is not less than 61° F. with a vacuum of at least 25 inches. Dissolved oxygen in the juice apparently reacts with some constituent in it and results in a disappearance of the oxygen. This disappearance is accelerated by high temperatures and may adversely affect the juice, especially with regard to the vitamin C content. [From authors' summary.]

1489. NELSON, E. K., AND WHEELER, D. H. 663.2  
**Natural aging of wine.**  
*J. industr. engng Chem.* (industrial edition), 1939, **31** : 1279-81, bibl. 12.

Tests were made on samples of red and white wines\* received at intervals from two New York wineries and one in California and results are here discussed. Among other observations made it was found that wines increased in volatile ester content during the 2 years of the trial when aged in vats. Wines hermetically sealed in glass increased in volatile ester content during a year's storage at room temperature.

\* Ives, Delaware, Clinton-Ives and Catawba wines.

1490. VALAER, P. 663.2  
**Brandy.**

*J. indust. engng Chem.* (industrial edition), 1939, **31** : 339-53, bibl. 18.

In this most interesting article comparison is made of the process of making brandy in France—the true cognac from the Charente region—in Greece and in California, and details are given of the differences observed with regard to technique, material, containers and final product. These differences are considerable. It is interesting to note that according to a French decree of 1936 the varieties of vines permissible for the making of Cognac are as follows:—St. Emilion, Folle Blanc, Colombar, Blanc Rame, Jurançon Blanc, Montils, Lemillon and Sauvignon. The most usual are the first three. Tabulated analyses are given of brandies from different sources including those made from fruits other than grapes. The greatest obvious difference found between cognac and California brandy was the presence in the French liqueur of a clear yellow oil after the fusel oils were exhausted and at the beginning of the aqueous portion in the analysis. This had a powerful cognac aroma and was present in whole cognac to the extent of 20 g. per 100 litres.

1491. HIRST, F., AND ADAM, W. B. 664.85.036.5  
**The drained weight of English canned fruits.**

*A.R. Fruit Veg. Pres. Res. Stat. Campden for 1938, 1939*, pp. 17-31, bibl. 2.

Figures given here are based on 750 tests of English canned fruits made in the last ten years. They indicate that the degree of ripeness, strength of syrup and conditions of processing all influence drained weight. The latter also alters during storage. There are wide differences between the average and the minimum drained weights. In this connexion the texture of the fruit is of such importance that some reference to the wholeness or firmness of the fruit would appear essential in framing appropriate regulations. Such regulations could best be based on the average drained weight of a definite number of cans of each commercial brand. [From authors' summary.]

1492. ADAM, W. B. 664.85.714/715.036.5  
**Notes on the composition and canning properties of loganberries and blackberries.**

*A.R. Fruit Veg. Pres. Res. Stat. Campden for 1938, 1939*, pp. 32-8, bibl. 4.

The chief difference in canning properties of the loganberry and the Phenomenal berry is found to lie in the paler colour of the latter. The acidity and pH value of loganberries does not alter appreciably through the season, but the total sugar appears to increase. No difference was found in chemical composition or canning properties of Black Diamond and Himalayan Giant blackberries. The pH value of blackberries falls during ripening from 2.7 to 3.4.

1493. ADAM, W. B. 664.84.656.047  
**The composition and texture of dried peas. III.**

*A.R. Fruit Veg. Pres. Res. Stat. Campden for 1938, 1939*, pp. 60-7, bibl. 2.

The influence of the following factors on the composition and texture of dried peas was studied:—variety, date of planting (varying from March to May had little effect), date of cutting, artificial drying.

1494. HORNER, G. 664.84.036.5 : 581.192  
**The mineral content of canned vegetables.**

*A.R. Fruit Veg. Pres. Res. Stat. Campden for 1938, 1939*, pp. 39-44, bibl. 6.

Tests were made of the loss in minerals sustained in the cooking and canning of vegetables, namely fresh and dried peas, stringless fresh beans, dried beans, carrots, potatoes and spinach. The losses were found to be approximately the same in both cases.



1495. MOLTZAU, R. H., AND RIPPERTON, J. C. 634.57-1.56  
**Processing of the macadamia.**  
*Bull. Hawaii agric. Exp. Stat.* **83**, 1939, pp. 31.

Among the hints given are the following :—Husk within 24 hours of harvesting, or spread nuts in a thin layer in wire-bottomed trays to dry. Do not keep green, unhusked nuts in sacks or tins. Dry on wire-bottomed trays to 3-4% moisture content in layers 2 or 3 deep. Air-drying takes 2-3 weeks, sun-drying about 1 week, and artificial heat 3-5 days. Cracking, mechanically, gives a maximum of whole kernels at a minimum cost. Use only grade 1 kernels for packing, i.e. kernels with a specific gravity of less than 1. The moisture content of the kernels should be reduced to 1.5% by a treatment for about 8 hours in a special forced-draft oven. After cooking for 12 to 15 minutes in a vat of refined coconut oil the still warm kernels are sprayed with an adhesive substance and are then sprinkled with salt. If left uncooked for a period longer than one month, the kernels should be dehydrated and stored in air-tight containers at 32° F. No special insect control measures are required if the nuts are processed without delay or are stored as suggested above.

1496. SAVASTANO, G. 634.63-1.56  
 Il frangomolitore delle olive. (**A new olive crusher and mill.**)  
*Ann. Staz. sper. Olivicoltura, Pescara, 1939*, pp. 67-96.

In this well-illustrated paper the author describes an apparatus devised and made at the Pescara research station for the separation of olives into convenient different component parts, which can then be dealt with separately.

1497. CRUESS, W. V., EL SAIFI, A., AND DEVELTER, E. 634.63-1.56  
**Changes in olive composition during processing.**  
*J. industr. engng Chem.* (industrial edition), 1939, **31** : 1012-14, bibl. 7.

1498. SAVASTANO, G., AND CASTORINA, S. 634.8 : 633.85  
 Sulla essiccattività dell'olio di vinaccioli. (**The drying properties of grape stones.**)  
*Ann. Staz. sper. Olivicoltura, Pescara, 1939*, pp. 179-87, bibl. 4.

Preliminary analyses and experiments indicate that oil from grape stones properly treated may be utilizable as a substitute for linseed oil in the paint and varnish trade, while the facility with which it can be polymerized makes it particularly suitable in other ways. There are indications that it may be successfully used for linoleum manufacture. Its drying properties are similar though not so fast as those of linseed.

1499. SAVASTANO, G. 633.71 : 633.85  
 L'olio del seme di tabacco come sostituto autarchico dell'olio di lino.  
 (**Tobacco seed oil as a substitute for linseed oil.**)  
*Ann. Staz. sper. Olivicoltura, Pescara, 1939*, pp. 163-76, bibl. 3.

Data are given of the comparative drying powers of linseed and tobacco seed oil and of the results of using certain dehydrating agents, namely, acetate of lead and cobalt and acetate and borate of manganese, to increase the drying powers of tobacco seed oil. The author came to the conclusion that this oil, although belonging to the semi-drying class, can be used after proper treatment as a substitute for linseed oil for different industrial purposes, e.g. linoleum, etc.

1500. HUMPHRIES, E. C. 633.74-1.56 : 581.192  
**Changes in fat and theobromine content of the kernel of the cacao bean during fermentation and drying.**  
*Eighth A.R. on Cacao Research for 1938*, I.C.T.A., Trinidad, 1939, pp. 34-6, bibl. 4.

During fermentation of cacao the fat content increased until the 5th day by about 4% on an oven-dry basis and slightly decreased during sun-drying after fermentation. There was little

alteration in the fat content of beans which were sun-dried only. There was a loss of theobromine during fermentation, slight increase when the beans were sun-dried after fermentation and a slight increase in beans sun-dried only.

1501. HUMPHRIES, E. C. 633.74 : 581.192

**A new method for estimating total alkaloids in cacao.**

*Eighth A.R. on Cacao Research for 1938*, I.C.T.A., Trinidad, 1939, pp. 36-7, bibl. 4.

A new method for the determination of theobromine and caffeine in cacao is described. Analyses of the alkaloid content of beans of different varieties of *Theobroma Cacao* are presented. [Author's summary.]

1502. HUMPHRIES, E. C. 633.74 : 581.192

**A critical investigation of the tetrachlorethane extraction method for determining theobromine in cacao.**

*Eighth A.R. on Cacao Research for 1938*, I.C.T.A., Trinidad, 1939, pp. 38-9, bibl. 2.

The relative methods of the Wadsworth and McDonald methods for estimation of theobromine were investigated. The latter method was found to be more satisfactory. Magnesia is not essential for mixing with the fat-free powder when tetrachlorethane is used as solvent. [Author's summary.]

1503. HUMPHRIES, E. C. 633.74 : 581.192

**A note on the estimation of fat in cacao.**

*Eighth A.R. on Cacao Research for 1938*, I.C.T.A., Trinidad, 1939, pp. 39-40.

Additional fat (about 2%) was obtained from supposedly fat-free cacao powder obtained by 20 hours petrol-ether extraction when further extracted by chloroform. "Fat-free" 20 hour petrol-ether extracted powder treated to a further 20 hours petrol-ether extraction yielded 1% approximately. It appears probable that residual fat is more readily soluble in chloroform.

1504. BIRCH, H. F., AND HUMPHRIES, E. C. 633.74 : 581.192

**The biochemistry of the cacao bean ; present state of knowledge.**

*Eighth A.R. on Cacao Research for 1938*, I.C.T.A., Trinidad, 1939, pp. 40-2, bibl. 37.

The present state of knowledge of the biochemistry of the cacao bean is reviewed under the following heads. The tannins ; the sterols and vitamins ; colouring matters ; lecithin ; fat ; alkaloids ; quality.

1505. LUCAS, P. S., AND GOULD, L. A. 633.74

**Flavouring characteristics of individual cocoa varieties.**

*Quart. Bull. Mich. agric. Exp. Stat.*, 1939, 22 : 12-7, bibl. 4.

Descriptions given by English authorities of the following cocoas are detailed:—Accra, Arriba, Bahia, Puerto Cabello, La Guaira Caracas, Sanchez and Trinidad. Chemical analyses and trials of different sorts in America show that public preference for flavour of chocolate varieties in ice cream seems to incline to the stronger varieties of bean with chocolate of a bitter type. Blending avoids seasonal change in flavour and provides colour and the desirable effects of more than one type of bean.

1506. SULIT, J. I. 634.421 : 664.85.421.035.5

**Studies on the manufacture of guava jelly.**

*Philipp. J. Agric.*, 1939, 10 : 173-85, bibl. 6.

The principles and the technique involved in the manufacture of guava jelly are discussed. The fruit used is that of the wild guava.

1507. BECKER, R. B., NEAL, W. M., AND DIX ARNOLD, P. T. 634.3-1.57 : 636.085

**Dried citrus pulp in dairy rations.**

*Pr. Bull. Fla agric. Exp. Stat.* 521, 1938, pp. 2.

The use of dried citrus pulp as feed has been investigated in a number of ways at the Florida Agricultural Experiment Station. It should be considered mainly as a carbohydrate concentrate but it is also a good source of calcium, an element often deficient in dairy rations. It is a poor source of phosphorus.

1508. GUNDRY, B. G. 633.71-1.56

**The "Gundry" tobacco furnace.**

Reprinted from *Rhod. agric. J.*, 1939, 36 : 31-8, as *Bull. Rhod. Minist. Agric.* 996.

Full details of construction with plans as well as method of operation and notes on points in running are given here of the Gundry tobacco furnace.

1509. GILLESPIE, T. G. 664.8.036.5 : 632.4

**Studies on the mould *Byssochlamys fulva* II.**

*A.R. Fruit Veg. Pres. Res. Stat. Campden for 1938, 1939*, pp. 60-7, bibl. 2.

**NOTES ON BOOKS AND REPORTS.**

1510. GARDNER, V. R., BRADFORD, F. C., AND HOOKER, JR. H. D. 634.1/8

***The fundamentals of fruit production*, 2nd edition. McGraw Hill, London, W.C.2, 1939, pp. 788. 33s.**

When the authors first issued this work in New York in 1922 they rendered a great service to fruit growing. Their aim was not to teach the beginner how to grow and sell fruit, but to show the bases on which all successful fruit growing must ultimately rest, in other words the fundamentals of fruit production. Casting their fine-meshed net far afield they tapped many sources not available to the individual student and produced a comprehensive encyclopaedia, which has ever since been the consultant and guide of all pomological investigators, so much so in fact that from one library known to the reviewer two copies disappeared in a year, and the new edition will be chained. And so in expecting from the authors a very high standard originally set by themselves we are just a little disappointed. Perhaps it is that in our eager excitement at the thought of a new book by these masters of craft we find only what they pretend it to be, a new edition. It differs from its predecessor not so much by change or even elimination as by addition. Nearly every chapter is just a page or two longer and small snippets of new evidence are produced on nearly every subject discussed. Thus in the chapter devoted to pathological phenomena due to excess or deficiency of moisture we find new paragraphs dealing with gummosis and sour sap, with tipburn and windburn, with endoxerosis. Under the heading of winter injury more space is usefully devoted to a discussion of the results of the late oncoming winters. The effect of light or dark colour of bark on the incidence of sunscald is also considered. Again, when dichogamy is discussed the avocado rightly comes into the picture. But there are a number of new developments in the science of fruit growing on which one might now legitimately seek for wisdom in a book of this calibre and these are either disregarded or dealt with summarily. Is it too much to hope that in the next edition some substantial mention should be made of photoperiodicity as affecting fruit production, of fruit seed treatment even vernalization, of the use of phytohormones in propagation, of leaf diagnosis, of injection as a measure of prophylaxis or nutrition? Here they are lacking. Yet, though a dyspeptic reviewer may grumble at still having to search in several quarters for information on particular subjects, the pomological research worker will merely transfer allegiance from the first to the second edition as his incomparable source of information on most occasions.



1511. BAGENAL, N. B.\*

634.1/8

**Fruit growing. Modern cultural methods.**

Ward, Lock &amp; Co., Ltd., London. pp. 399. 21s.

The appearance of this volume is welcome. The activities of the writer in the field of practical, educational and scientific horticulture have furnished him with unrivalled opportunity for study in the whole field of fruit growing, commercial and otherwise, and in *Fruit growing. Modern cultural methods* we have condensed, in very readable form, a fund of knowledge quite unobtainable by the great majority of authors. The book can be considered in two sections: the first covers in critical manner the principles and problems connected with the growing of fruit largely from the commercial aspect, though the general principles apply equally in the private garden; the second deals in detailed manner with the culture of particular fruits both in the open and under glass. The term "fruit" has been interpreted liberally to include nearly forty distinct kinds capable of being grown in these islands, although not all are here of economic importance. It is this economic aspect which governs the space devoted to the different fruits. Thus, the apple, pear, plum and cherry, bush fruits and strawberries receive the greatest and most critical attention. The information is based on practical knowledge supported by the findings of scientific research. The same cannot be said, however, of all the fruits dealt with, but where such knowledge is lacking the writer is strictly conscientious in not "packing" the book with a mere repetition of empirical knowledge. In Chapter I, "General considerations", the reader is given a bird's-eye view of some of the problems confronting the prospective planter. The importance of a chain of requirements relating to the successful production of fruit is emphasized, ways and means of satisfying them are shown and the individual links required to complete the chain are discussed in detail under their respective headings, in succeeding chapters. No prospective planter after grasping the import of these chapters should be guilty of rushing into the task of fruit production without due thought. Manuring is discussed largely in the light of the results of exhaustive work by the Long Ashton Research Station and the principles of tree nutrition are stated in non-technical language. Varietal requirements are given in addition to the particular requirements of different fruits under varying conditions of soil, management and of rootstock. The information is worthy of the closest study especially by the private gardener. In Chapter IV on "Propagation of trees and bushes" the processes of raising rootstocks and of budding and grafting are clearly described, as also is headworking, including the newer practice of framework grafting. The paragraphs on the latter should open up a new field of interest to many practical minds. The illustrations are clear and accurate and vastly better than the crude sketches so often presented. Methods of tree pruning as it affects the different fruits are detailed later under the appropriate headings. Here the general principles are discussed on the basis of three stages in the life of a tree, namely youth, adolescence and maturity. The reader is left in no doubt that a clear understanding of tree habit and response is of far greater value than any set of rules. The grower must know his trees. Tree form next receives attention. The forming of various tree shapes, commercially recognized and otherwise, is explained with the generous aid of clear illustrations, but the novice is warned that the initial stage in the forming of espalier, fan and other unusual forms of tree is one best left to the skilled nurseryman. The chapter on "Planning and planting" is one of the most important in the book. The necessity of providing for the manurial, cultural and spraying requirements of different varieties and kinds of fruit, and provision for adequate cross-pollination are carefully explained and valuable suggestions are made for overcoming these problems, particularly in commercial plantations. The difficulties of establishing a satisfactory mixed plant, i.e. the growing of more than one kind of fruit in a plantation, are shown in the light of varied cultural requirements and the advice to keep different fruits apart is sound. An exception is made, however, in suggesting a mixed cherry and plum plantation where the plums are considered essentially as fillers. The cultural requirements of these two fruits are sufficiently alike, at least until the cherries become fully established, to make the proposition a practical one. Several plans are put forward for commercial plantings of cherry, plum and apple, and the importance of allowing for pollinators to remain in the permanent plant if the plantation is thinned, will be

\* Technical assistant, East Malling Research Station.

a useful reminder to many. Such suggestions as an apple plant comprised of Bramley, Grenadier and Lord Derby or Arthur Turner and of Cox, Worcester and Superb are welcomed, if only from the point of view of limiting the varieties grown to a few, well proved, market varieties, consistent with a simplification of orchard management. Systems of marking out, support, tying and protection from stock and vermin are discussed and a comprehensive table is given of the most suitable planting distances, rootstocks, age of tree to plant, etc., for a long list of fruits. The pages on gathering, storing and marketing will chiefly interest the commercial grower, and the section on exhibiting at commercial fruit shows is written by one well aware of the exacting requirements of present-day competitive shows. In Chapter XI the necessity for the proper control of pests and diseases in the economic production of the various fruits is fully stressed. Methods of application of numerous sprays are described and useful information is included on the various spray materials employed on the fruit farm. "A guide to spraying", in table form, is a concise guide to pest and disease control and constitutes a ready form of reference. Complementary to this is included a "Diseases and pests: diagnosis table". Used in conjunction with the above guide, it forms a rich digest of the information now available on the complex subject of disease and pest control. Full details relating to particular pests and diseases are given later. The book now passes from general considerations and principles to the particular requirements of the various fruits. Full use has been made of the findings of the research stations in their bearing on cultural practices. Problems of propagation, pruning, manuring, pollination, etc., are fully discussed and sound advice is given. Some fifty pages are devoted to the apple alone and notes are included on cider fruits and ornamental and flowering crabs. The cherry receives detailed attention and valuable tables are included on the subject of suitable pollinator varieties. The information on pears, plums, black and red currants, raspberries, strawberries, blackberries and loganberries, is carefully compiled. Variety lists are in general somewhat long, but they have been well thought out from the point of view of both private and commercial grower. The former can satisfy his fancy to the full, while the latter is referred to the shortened lists which are a useful inclusion, e.g. "Good market varieties", "Scab resistant varieties", "Twelve leading sorts of cherry", etc., etc. The private grower will find much of value in the sections dealing with the apricot, peach and nectarine, and short notes are included on the outdoor culture of the grape and many less common fruits. The section on the walnut makes interesting reading and the information given will be new to most readers. The latter part of the book concerns the cultivation of some seventeen different fruits under glass. They include the cucumber and tomato, short notes on the orange, pineapple and melon, in addition to more detailed instructions regarding the peach, grape vine, etc. Training and general management are clearly described. The book is well printed and the illustrations are well chosen, accurate and clearly reproduced. In the preface, the Editor states:—" . . . The aim has been to give both to the amateur and professional fruit grower accurate and up-to-date information which will enable him to produce fruits successfully. . . ." The aim has been fully realized and the result is a valuable textbook for the student and a fund of reliable information for the grower.

G.W.H.

1512. IMMS, A. D.

595.7 + 632.6/7

***Recent advances in entomology.***

J. &amp; A. Churchill, Ltd., London. 2nd edition, 1937, pp. 431, figs. 94. 15s.

This is the second edition of a book published in 1931. The subjects dealt with are the same as in the first edition, but it is enlarged by some 55 pages. Several chapters of particular interest to economic entomologists have been modified and rewritten, and those dealing with the regulation of the growth of the crop, host selection and biological races, biological control of insect pests and the control of noxious weeds by insects contains an enormous amount of invaluable information. The carefully selected references to the relevant literature at the end of most chapters are a real asset to the student who requires further information, since it is impossible to treat fully of each subject referred to in a book of this nature. The critical compilation of this work is of such a high standard that Dr. Imms will receive the gratitude of entomologists of many countries.

A.M.M.

1513. LENIN ACADEMY OF AGRICULTURAL SCIENCES. 634.7

**Flora of cultivated plants. XVI. Small fruits.** [Russian.]

Selkhozgiz, Leningrad, 1936, pp. 285, bibls. for each section, 7.25 roubles.

Plants grown or intended for cultivation in U.S.S.R. are here described in considerable detail. They include *Berberidaceae*, *Grossulariaceae* Dumort, *Rosaceae* Juss., *Dilleniaceae* DC., and *Vacciniaceae* Lindl. A non-Russian reader will be glad of the index in English, of the use of Latin scientific names for the plants, and of the valuable lists of references at the end of each section.

1514. LENIN ACADEMY OF AGRICULTURAL SCIENCES. 634.5

**Flora of cultivated plants. XVII. Nuts.** [Russian.]

Selkhozgiz, Leningrad, 1936, pp. 354, bibls. for each section, 8.50 roubles.

This book on various nuts grown or intended for cultivation in U.S.S.R. is one of the series on "Flora of cultivated plants" (see also previous abstract). Similar books have already appeared in print or are forthcoming shortly on roots (VIII), tubers (IX), vegetables (X and XI), gourds (XII), fruits (XIV and XV), sugar plants, spices and stimulants (XVIII), essential oil, resinous and medicinal plants (XIX and XX), rubber plants and dye plants (XXI).

1515. INSTITUTE OF PLANT PROTECTION, U.S.S.R. 632

**Pests and diseases of cultivated plants in Eastern Siberia and their control.** [Russian.]

Irkutsk Region Publishers, 3rd revised edition, 1938, pp. 118, 1.75 roubles.

KHAEV, M. K., CHIZHOV, S. T., SUKORTSEVA, K. D., AND ZAOSTROVSKAYA, E. N. 635.1/7

**Vegetable growing.** [Russian.]

Selkhozgiz, Moscow, 1939, pp. 383, 3.65 roubles.

U.S.S.R. DEPARTMENT OF AGRICULTURE. 63

**Soviet Agronomy.** [Russian.]

Selkhozgiz, Moscow, 1939, 18 roubles for 6 numbers.

A new periodical largely dealing with soils and fertilizers.

1516. IMPERIAL ECONOMIC COMMITTEE, LONDON.

658 : 634.1/8 + 635.1/7 + 635.9 + 635.944

**Fruit supplies 1938, including vegetables, flowers and bulbs.**

H.M. Stationery Office, Kingsway, London, W.C.2, 1939, pp. 105, 2s. 6d.

Figures are here given of production, consumption and imports in 1938 into the United Kingdom of different fruits, vegetables and bulbs. Notes appear on the North American apple season, 1938-9, the South African deciduous fruit season, 1938-9, the Australian and New Zealand deciduous fruit season, 1938, the Palestine citrus fruit season, 1938-9, the Spanish orange season, 1938-9, the summer orange season, 1938. Imports into Eire, Germany, France and the Scandinavian countries and the raw fruit trade of the United States are discussed.

1517. IMPERIAL ECONOMIC COMMITTEE, LONDON. 633.5 : 31

**Industrial fibres.**

H.M. Stationery Office, Kingsway, London, W.C.2, 1939, pp. 128, 2s. 6d.

These are world figures for the period 1931-2 to 1938-9 of production and consumption of and trade in cotton, wool, mohair, silk, flax, hemp, jute, coir and rayon.

1518. AMANI. 63(072)

**Tenth Annual Report East African Agricultural Research Station for 1937** (Apr. 1-Dec. 31), 1938, pp. 40. H.M. Stationery Office, London, 1s.

The work of the plant pathology section was concerned with the mechanism by which insects transmit virus diseases of cassava and maize and with the breeding of resistant cassava types.



The successful crossing of cassava with Ceara rubber (*Manihot Glaziovii*) is reported for the first time. The plant physiologist (F. J. Nutman) reviews the position that plant physiology now occupies in relation to tropical agriculture and emphasizes the fact that the success of future work depends largely on the development of suitable apparatus. The progress made by the geneticist in the breeding and selection of *Agave* and coffee is noted. An investigation of the root system of sisal has just been started. Biochemical work has been mainly directed to investigations into the toxic principle of *Derris* and *Mundulea*.

1519. AMANI,

63(072)

**Annual Report East African Agricultural Research Station for 1938, 1939, pp. 56.** H.M. Stationery Office, London, 1s.

The plant pathologist (H. H. Storey) discusses his researches on the manner in which an insect inoculates virus into a plant and on the causes of variation in ability to infect shown by different individuals of a single species. He refers to his recently published paper\* and to the photographs in it of leaf sections, which show the course taken by the mouth parts of *Cicadulina mbila* during punctures resulting in infection. A suspected virus disease of passion fruit resembling the woodiness† disease of Australia was studied and a co-operative line of research with Kenya Colony drawn up. Biochemical research was confined almost entirely to the histology of rotenone in *Mundulea*, *Tephrosia* and *Derris* species. Results indicate that *Derris* is likely to give a more toxic root in soil poor in nitrogen or potash than in rich soil, that serious shortage of calcium or of phosphorus is detrimental to growth, whereas shortage of nitrogen or potash makes little difference. Dr. F. J. Nutman, plant physiologist, devised at the Imperial College of Science and Technology, London, a successful method for measuring small changes in carbon dioxide concentration in an air stream, based on the absorption of infra-red radiation by carbon dioxide. The apparatus invented to exploit this method will be used to exploit the many outstanding problems connected with carbon assimilation of tropical crops. A new method for measuring transpiration from attached single leaves under natural conditions was also developed. Work on sisal seems to show that the mean yield of fresh leaf from poling plants in each age group is considerably in excess of that given by non-poling plants. Some recommendations made by the newly formed Inter-territorial Coffee Research Committee of East Africa are noted.

1520. ARIZONA.

634/5

**Forty-ninth Annual Report Arizona Agricultural Experimental Station for year ending June 30, 1938, 1939, pp. 84.**

The chief items of horticultural interest are as follows:—*Citrus*. It is found that grapefruit which will give satisfaction to the consumer may differ considerably in percentage of juice and in ratio of total soluble solids to acid. There are indications that a satisfactory maturity must be sought for based on a sliding value for soluble solids-acid ratio in relation to size and juice content. Fertilizer experiments tend to emphasize the importance of nitrogen. The effect on growth and production of opposite treatments is being tested. The treatments are (1) feeding to increase the vegetativeness and nitrogen content of the trees and (2) starvation practices to reduce vegetativeness and N content but increase the carbohydrate content. Studies of grapefruit storage showed that as the season advanced there was a gradual hydrolysis of sucrose to simple reducing sugars in fruit in storage and on the tree. *Vegetables*. Studies are being made on lettuce seed storage conditions and on manuring of lettuce. *Date palms*. Storage trials showed that after 6 months' storage at 5° F., Sayer and Khadrawi dates were lighter in colour than those stored at 32° F. and that there were no harmful results from the treatment. Soda lime and paper liners did not reduce the loss from discoloration and deterioration in flavour in dates packed in moisture-proof containers. *Pecans*. Various attempts are being made to counterbalance the rather excessive temperatures of the Yuma Valley. *Peaches*. Seeds of the Shalil peach, a variety said to be very resistant to root nematodes, have been sown at Tucson, in nematode-infested areas.

\* Storey, H. H. 1938. Investigations of the mechanism of the transmission of plant viruses by insect vectors. *Proc. roy. Soc. Lond.*, Ser. B., 1938, 125: 455-77.

† Anon. Woodiness disease of passion fruit. *E. Afr. agric. J.*, 1938, 3: 247, *H.A.*, 8: 1043.

1521. A.S.L.I.B.\* 63 : 659.25  
**Report of Proceedings of the Fifteenth Conference, Oxford, 1938,**  
 pp. 133, 5s.

One session of the proceedings was devoted to a review of current practices with regard to the organization of information services. A lamentable feature of this interesting session was the absence of any paper on agricultural organization. Attention was drawn to the existence of the Imperial Agricultural Bureaux in the subsequent discussion.

1522. BERMUDA. 634/635  
**Report of the Department of Agriculture, Bermuda, for 1938, 1939,**  
 pp. 63.

Experiments have been made by the Horticultural Section on the following :—*Amaryllis*. Artificial vegetative propagation. Methods as practised in Florida were tried. Bulbs lifted April to September were cut vertically into 4, 8, 16, 32 and 64 parts. These were inserted in a mixture of marsh peat and sand. It was shown possible thus to increase amaryllis quickly, the best results being obtained from bulbs cut into 16ths in mid-June. *Carnations*. Experiments with perpetual flowering carnations showed that normal methods of cultivation were not suitable. *Gladiolus*. Treatments of cold storage at 40° F. for 4 weeks and of exposure to ethylene chlorhydrin vapour (8 c.cs. to 1 gallon measure of corms, i.e. 40-50) and of a combination of the two showed that the chemical treatment alone gave definite advantages in promoting satisfactory growth of corms in the second season. The work is being continued. *Lighting*. Increased light exposure of various plants was found to be beneficial but uneconomic. *Plant hormones*. Out of 30 plants the cuttings of which were treated with indolyl-acetic acid or phenyl-acetic acid only *Brunfelsia americana* showed a good response. *Roman hyacinths*. Cultivation for the English market indicates the necessity for added phosphates. *Irrigation*. Work was started with overhead irrigation for vegetables, strawberries and flowers. *Loquat* growing. This fruit shows great promise and is being subjected to selection from leading Californian varieties. The report concludes with a list of plants under propagation at the Agricultural Station and a list of seeds available to applicants.

1523. BRITISH HONDURAS. 633/635  
**Report of the Department of Agriculture of British Honduras for 1938, 1939, pp. 33.**

As regards horticulture this is mainly an account of results of seasonal work in the different staple crops, viz. citrus, cassava, bananas, coconuts. In addition there are notes on observation plots of cacao and liberica, arabica, robusta and excelsa coffee.

1524. CALIFORNIA AGRICULTURAL EXPERIMENT STATION (HUTCHISON, C. B., AND FREEBORN, S. B.) 63 : 581.08  
**Towards better agriculture.**  
*Rep. Calif. agric. Exp. Stat. 1936-8, 1939, pp. 211.*

Although this extremely concise yet clear account of the work of the California Agricultural Experiment Station, Berkeley, is so full of facts as to defy the abstractor, it is warmly recommended to research workers in horticulture. In view of its value it is proposed to list those problems on which important but brief research notes are given. They include :—onion downy mildew, onion pinkroot ; breeding of tomatoes, strawberries, peaches resistant to delayed foliation and mosaic, almonds and wine grapes ; rootstocks for grapes, pears resistant to blight and lemons ; lemon decline. Plant hygiene projects include :—boron and deciduous fruit trees, prune die back, manuring of citrus, psoriasis, granulation of oranges, citrus fruit rots, citrus water spot, date decline and spoilage, fig smut and mould, grape diseases, bacterial canker of stone fruit, Kelsey spot in plums, delayed foliation, diseases of vegetables and flowers, scale control, codlin on walnuts, cyclamen mite in strawberry.

\* Association of Special Libraries and Information Bureaux.

A chapter on improving the mechanics of crop production discusses, among others, projects dealing with the following subjects:—chlorate and other herbicides, irrigation of fruit trees and costs, pollination of apples, cherries and plums, thinning of apricots, pruning grape vines, citrus dusting, orchard heaters, frost protection blowers, precooling of fruit and truck crops for shipment.

Chapter 6 on pleasing the customer gives précis of results of work on sulphuring dried fruits drying fruits, maturity of table and raisin grapes, effect of temperature on growing grapes colour in wine, wine types and avoidance of "foxiness", wine making, fruit and vegetable juice making, other outlets for surplus fruit, olive products, maintenance of natural colour in processed fruit and vegetables, gas storage of fruit.

Summaries of station publications are included. Finally also a full list is given of other publications of members of staff during the years in question.

1525. CANADA, DEPARTMENT OF AGRICULTURE. 632: 634 + 635  
***Progress Report of the Dominion Botanist\* for the years 1935-7 inclusive***, 1938, pp. 100.

Progress on the following projects of interest to horticulturists is reported:—economic botany; weeds and poisonous plants; diseases of ornamentals; fruit diseases; potato diseases; vegetable diseases.

1526. CAWTHRON. 63(072)  
***Annual Report Cawthron Institute, Nelson, N.Z., for 1938***, 1939, pp. 35.

Fruit research includes the following items:—Boron deficiency ailments. Definite control of brown spotting of apricots was got by a 0.1% borax spray or  $\frac{1}{2}$  lb. borax as top dressing round the tree in spring. A top dressing of  $\frac{1}{2}$  lb. borax per tree gave commercial control of internal cork of apples for at least 3 seasons. The experiment is being continued to determine how long such a dressing will be efficacious. Tests indicate that borax sprays at 0.20% and 0.10% are perfectly safe for foliage if properly mixed and if lime is used in conjunction with lead arsenate sprays. Cool storage tests of Jonathans from trees sprayed with 0.20% and 0.10% borax showed no reduction in keeping quality. Early defoliation of Jonathan trees was shown by injection experiments to be caused by Mg. deficiency and to be controllable by Mg. salts. Since, however, low figures for Mg. are associated with high ones for K, the role of potash needs examination. Complete manuring with N, P and K was found necessary for apples at the Annesbrook orchard. Northern Spy rootstocks continued to show superiority to seedling stocks for Cox's Orange Pippin. Jonathan and Sturmer gave better results with Double Vigour and seedlings than with Northern Spy. Two raspberry pests, the bud moth, *Carposina adreptella* and sawfly, *Priophorus tener*, are under investigation. Five cycles of woolly aphid were observed in the current season. Tomato work has included investigations into control of mildew, *Cladosporium fulvum*, varieties and hybrids. Tobacco soils are being surveyed and the chemistry of the leaf obtained is being examined. In addition seed germination studies are in progress. Investigations on biological weed control are being directed against gorse by means of the weevil, *Apion ulicis*, against ragwort by a seed-fly [unnamed], and against piri-piri by the Chilean saw-fly, *Antholeus varinervis*.

1527. CEYLON. 63(012)  
***Administrative Report of the Acting Director of Agriculture, Ceylon, for 1937***, 1938 reprinted 1939. Part IV, Education, Science and Art, pp. 93, Rs. 1.

The report includes a note of experimental work in progress or contemplated, but results achieved are not discussed.

\* H. T. Güssow.



1528. COCONUT RESEARCH SCHEME (CEYLON) (PIERIS, W. V. D.). 634.61-1.52

**Geneticist's annual reports for 1936 and 1937.**

*Bull. Coconut Res. Scheme (Ceylon)* 4, pp. 57.

Detailed reports of the work of the geneticist of the Ceylon Coconut Research Scheme for 1936 and 1937. Papers in connection with this work have already been abstracted in *Horticultural Abstracts*.

1529. COCONUT RESEARCH SCHEME (CEYLON) (SALGADO, M. L. M.) 634.61-1.4

**Annual reports of the soil chemist for the period July 1933 to Dec. 1937.**

*Bull. Coconut Res. Scheme (Ceylon)* 3, 1938.

Detailed reports of the work of the soil chemist, Ceylon Coconut Research Scheme, for 1935-7 with a summary of previous reports from 1933. Papers in connection with this work have already been abstracted in *Horticultural Abstracts*.

1530. COSTA RICA. 633.73 + 633.61 + 633.912

**Informe anual 1938. (Annual Report, 1938.)**

*Bol. Centro. nac. Agric. Costa Rica* 25, 1939, pp. 128.

The report describes the work of the various departments of the Ministry of Agriculture, Costa Rica. Experimental work in plantation crops was chiefly directed to a study of the value of organic and of chemical manures in the cultivation of coffee, trials of pruning systems in coffee, the study of new introduced varieties of sugar cane and preliminary acclimatization trials with *Hevea brasiliensis* varieties with a view to the establishment of a rubber industry.

1531. COUNTY ARMAGH COMMITTEE OF AGRICULTURE. 634/5

**Report of horticultural instructors.\***

*Thirty-eighth A.R. County Armagh Cttee Agric.*, 1939, pp. 78-105.

Notes are given on the results of experiments on capsid control (including the use of thiocyanate), apple scab control, strawberry, raspberry and potato varieties and on various demonstration plots for strawberries, raspberries and vegetables.

1532. DUTCH EAST INDIES. 634/5

*Verslag over het jaar 1938 van het Algemeen Landbouw Syndicaat enz.*

**(Report for 1938 of the Algemeen Landbouw Syndicate.)**

Ruygrok & Co., Batavia, 1938, pp. 248.

A combined annual report of the activities of the research stations and their satellite associations concerned with perennial crops in the Dutch East Indies.

1533. FLORIDA. 634/5

**Golden Anniversary Report of the Florida Agricultural Experimental Station for the fiscal year ending June 30, 1938, 1939 (?), pp. 198.**

To all interested in horticultural research in warm, temperate or sub-tropical conditions this report is strongly recommended. Reports of results of a very great variety of projects are presented in concise but readable form and the system of indexing enables the account of any one project to be run down with a minimum of delay. The following list only pretends to include a few of the more important projects reported here. Effect of green manures on soil composition, vitamin C content in Florida fruits and vegetables, entomological problems, pecan manuring, pecan varieties, cultural problems of tung oil, cover crops for pecans, relation of N absorption to pecan growth, propagation of mayhaws (*Crataegus* spp.), preservation of juice of Satsuma and of Pineapple orange, gas and ordinary cold storage of citrus, maturity in citrus, effect of soil reaction on beans, eggplants and tomatoes, effect of green manuring on vegetable

\* J. Hagan and J. Scrimgeour.

plant hormones for rooting cuttings, plant pathology problems including investigations on fruit rots in grapes, gummosis and psorosis in citrus. At the Citrus Station :—dieback of citrus, citrus scab, citrus soils, melanose and stem end rots of fruits. At the Sub-tropical Station :—citrus culture (citrus worked on rough lemon more drought resistant than on other stocks), cover crops, diseases of avocado and mango.

1534. HAWAII.

63(072)

**Report Hawaii Agricultural Experiment Station for 1938, 1939,**  
pp. 101.

*Papaw.* Some genetical work with papaya is reported. A generic factorial explanation for sex inheritance in this fruit has been established. In storage experiments cold treatment for 12 days at 32°-34° F. killed all fruitfly eggs and larvae without appreciably injuring the ripe fruits but it seriously injured mature-green and firm ripe fruit. Fumigation with methyl bromide was more promising but firm ripe fruit or mature-green fruit only could be used, as ripe fruit could not stand the removal of the vacuum after fumigation. In cold storage experiments firm ripe fruit, sterilized and stored at 40° F. did not develop so high a quality as fruit allowed to ripen for several days at room treatment and then placed in storage. Fruit could be held at 40° for 2 weeks after treatment for fruitfly but two storage diseases, *Colletotrichum* and *Rhizopus* are serious. *Macadamia.* A system of rating samples of nuts has been devised; its chief use will be in selection and breeding work. A large number of experiments have recently been laid out with *Macadamia*, but results cannot be expected for some time. *Coffee.* A study of growth and yield relationship indicated that certain growth responses are dependent on or conditioned by the size and volume of the developing crop; that the volume of the crop is largely determined by growth made during the preceding growing and crop season; that these biennial bearing relations may be temporarily disturbed by a dominant weather factor, but that judicious manuring and pruning should reduce the extreme biennial variations in growth and yield typical of the district. A number of pruning systems are in their second year of investigation. Advantages have been noted in the system of bending the old verticals to an angle of 45° at a time when the verticals would normally be removed. *Mango.* An examination of the composition of mango fruit at various stages of maturity discloses a very marked increase in sucrose with a corresponding decrease in acid-hydrolyzable material during ripening. Best results in storage were with ripe or mature-green fruit allowed to ripen at room temperature and subsequently held at 3°-4° C.; such fruit maintained its high quality for 2 weeks or more. Green fruit failed to ripen in cold store and rotted without ripening on removal to room temperature. The other investigations do not concern this Bureau.

1535. INDIA, IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH.

634/5

**Agricultural and animal husbandry in India 1936-37, 1939, pp.**  
503, Rs. 7 or 11s.

Pages 146-56 contain an account of the horticultural research work for the period. The American method when budding citrus of leaving the wood at the back of the bud was compared with the Indian method of removing the wood. In the Punjab the Indian method was 25% more successful but the American method was 25% quicker in use and gave better results when dealing with immature budwood or when used by unskilled budders. The viability of papaya seed deteriorated in Madras after even a fortnight's storage. Selection for vigour in the seed beds proved to be an unsafe method of procuring early flowering female trees. A number of research stations are studying rootstocks. In the United Provinces several East Malling apple stocks were found too susceptible to woolly aphis, but the aphis-resistant Merton 779 and Merton 793 maintained the character of resistance and proved vigorous growers. In Bihar mango rootstocks S12 and S13 are developing vigorous and dwarfing influences respectively. In Madras a differential take between varieties of citrus on a given rootstock variety was observed. In the United Provinces *Prunus Pissardii* was the best pollinator for the self-sterile Maynard plum. Clean versus grass cultivation of mangoes in Bihar showed fruitfulness to be directly related to leaf-area per unit of shoot length and it was thus higher under grass, though actual

shootgrowth and leaf-area were higher under clean cultivation. At Lyallpur, Punjab, growth/yield studies with Langra mangoes indicated the importance for fruit bud formation of early cessation of growth in summer. They also showed that fruit-bearing shoots do not make extension growth and therefore do not fruit the following season, but that if deblossomed they make extension growth and will fruit the following year. From this it is suggested that the alternate bearing of mangoes might be checked by deblossoming or light thinning of 1-year-old shoots. Mulching significantly decreased fruit drop in peaches. At Lyallpur ringing grapes 15 days after the berries had set advanced ripening by 8-10 days. The recent work of the Lyallpur fruit products laboratories is outlined. Fruit storage research at Poona produced the following results among others: Yellow-ripe Nagpur oranges will keep for 3 months, Malta oranges for 4 months, at 40° F. Alphonso mango stores best (seven weeks) at 45°-48° F. It should be stored when fully developed but green. Peaches from the North-West Frontier Province kept for one month at 35° F. Other optimum storage temperatures were banana 60° F., sapodilla 52°-56° F., litchi 30°-35° F. (length of storage period not stated), seed potatoes for a period of several months at 25° F. In the allusions to pests and diseases it is mentioned that wither tip of citrus (*Cloetotrichum gloeosporioides*) could attack mango.

1536. MADRAS, DEPARTMENT OF AGRICULTURE.

63

***Reports of the work on the Agricultural Stations in the Madras Presidency for 1937-38, 1939, pp. 888.***

Pages 759-834 are concerned with horticulture. At the Pomological Station, Coonoor, the apples Irish Peach, Allsopp's Early, Five Crown Pippin and Mountain Pippin were practically immune to woolly aphis, whereas Winterstein, Rome Beauty, Democrat and Edward VII were very susceptible. At the Kallar Fruit Station the following are being tested as stocks for mangosteen, (*Garcinia mangostana*), *Garcinia tinctoria*, *G. cowa*, *G. gambogia*, *G. speciosa*, *G. indica*, *G. livingstonei*. At the Kodur Fruit Research Station the following results were obtained from experiments which are described; statistical analyses are also usually tabulated. With stocks of seedlings from one tree of kichili (*Citrus Madraspatna* Tanaka) and budwood from one tree of chinee orange (*Citrus sinensis* Osbeck) the presence of the wood at the back of the bud-shield increased the take by 32% over buds with the wood removed; cutting back the stock at time of budding did not affect take but stimulated bud break by 5 days. Slightly more pronounced results of the same nature were obtained when acid lime (*Citrus aurantifolia* Swingle) was the scion. No significant difference in rate of growth was found between early and late germinating seedlings of jamburi (rough lemon), thus it is unnecessary to select earlier germinated seedlings to make vigorous stocks. Optimum months for budding were discovered and a 9% difference in number of successful takes between the two common rootstocks, kichili and ganjaninna (*Citrus spp.*). A summary is given of the information on root systems obtained from the excavation of 8 varieties of citrus rootstock budded with chinee orange and unbudded. It is too detailed to be satisfactorily abstracted. With mango shelled stones gave a much lower germination than unshelled stones but were under observation for only 33 days instead of 45-60; sowing the stones with the plumule up produced a straight tap root and stem thus facilitating root grafting and inarching; shelled stones produce a straighter tap root and stem than unshelled stones. A number of seedling varieties of mango from the west coast of South India were found to be polyembryonic, contrary to the common belief that all Indian varieties are monoembryonic. Transplanting mangoes with naked roots was found to be quite feasible given ordinary care. An optimum season was established for mango inarching. Rootgrafting with mangoes is to be tried to eliminate the supposed influence of the stock stem. The most successful method was to leave about 3 inches of root exposed near the collar at the final potting, and to graft a month later. A notch was cut at the top of the pot through which the exposed root piece was made to project. The method of grafting was by approach. Double working is a natural complement to root grafting and has proved easy. Etiolation combined with wire ringing of shoots springing from layered branches has not been successful with mangoes. Of 25 ringed mango cuttings 6 put forth fresh growth and one established an excellent root formation. The rest failed. Treatment with Hormomone A failed to produce rootgrowth in



mango cuttings. Preliminary trials with budding (6 methods) gave sufficient success with bedded stocks to warrant large scale trials. The buds failed on potted stocks, possibly due to slower root development in the pot. Studies in yield show that there are never more than a small proportion of consistently heavy bearing trees in any plantation, that there is no relation between gross yield of a plantation and the proportion of so-called heavy bearers, that abundant blossom does not necessarily indicate a heavy crop, and that shoots on which the blossom is injured or destroyed will produce a second set of flowers. With papayas the swinging metal indicator was found to be useless for sex determination. The theory of sex determination by root form (single tap root = male, forked tap root = female) was also found to be fallacious. No connexion between sex of the seedlings and their position (base, middle or apex) in the fruit before germination could be established. The heading back of flowered male papaya trees did not induce them to change their sex. Two appliances invented at Kodur deserve mention, (1) a pot stand to clamp the pot to a branch or post when inarching from bearing trees; this consists of 2 adjustable metal rods connected at one end and furnished at the extremities with a metal ring pot holder and a clamp respectively, while another small rod aids precise adjustment of the stand in relation to the position of the scion shoot; (2) a pineapple-eye extractor based on the principle of the forceps, for use in the kitchen or when home canning. The extractor is quicker and less wasteful than the usual method of scooping the eyes out with a knife.

1537. MAINE.

634/5

**Report of progress for year ending June 30, 1938.***Bull. Me agric. Exp. Stat.* 391, 1938 (?), pp. 233-332.

Studies of horticultural interest include the following:—The pea aphid, *Macrosiphum pisi*, and its control. Tests are being made of a power duster. This is driven by a 10 HP engine, the duster being equipped with a tubular boom and covering 24-36 ft. An apron which forms part of the equipment encloses the dusting nozzles and trails behind. The material is "gas-proof slicker cloth". The complete apron is 100 ft. long, but for convenience in handling is cut in two. Pests and diseases, their incidence and control. Winter injury. An experiment is being laid down to test the mutual effect of stock and scion as affecting hardiness. The material consists of leading commercial varieties of apple topworked on to Virginia Crab and Hibernial. Vegetable trials have mainly been varietal. Small fruit work includes blueberry trials with regard to fertilizers, varieties, propagation from cuttings with the help of growth substances (unsuccessful), control of weeds especially of bunchberry, *Cornus canadensis*, and pests.

1538. MASSEY.

05 : 017 : 63

**Periodical publications contained in the library of Massey Agricultural College, Palmerston North, June 1939, pp. 27 (stencilled).**

It is noted that an interim period in library work at the Massey College enables this stencil to be prepared. One longs for a time when periodical interim periods will be compulsory at all such Institutes and Research Stations and even Imperial Bureaux, so that similar useful lists may be prepared. We are grateful for this one.

1539. NORTH CAROLINA.

634/5

**Sixty-first Annual Report North Carolina Agricultural Experiment Station for fiscal year ending June 30, 1938, 1939, pp. 83.**

Studies interesting to horticulturists concern the following:—Tobacco diseases; peanuts including diseases, leaf hopper, selection and fertilizers; peaches, including the good effect of magnesium treatment and of the applications of high grade fertilizers on the incidence of *Bacterium Pruni*, effect of boron, root development; apple growing including sprays, varieties; pecans; small fruits including raspberry, dewberry and blueberry breeding, raspberry manuring, strawberry rotations; roses in the open and under glass; bulb manuring.

1540. SEALE HAYNE. 634+635  
**Fifteenth Annual Report Department of Plant Pathology, Seale Hayne Agricultural College, for the year ending 30 Sept. 1938,\***  
 1939, pp. 39.

Brief accounts are given of work on the following subjects of particular horticultural interest :—*Aphelinus mali* (there are indications that it is becoming acclimatized and effectively dealing with woolly aphis) ; planting dates for anemones ; narcissus leaf diseases ; fruit pest incidence (starlings are becoming a menace to apples) ; bulb eelworm and other flower pests ; potato aphids, potato hot water treatment, potato blight ; diseases of potatoes, broad beans, vegetables, fruit and flowers.

1541. SOUTH AFRICAN CO-OPERATIVE CITRUS EXCHANGE LTD. 634.3  
**Director's Report for year ending 31 Dec. 1938,** 1939, pp. 25.

An account of the economics of handling together with a general survey of the economic situation in April 1939.

1542. SOUTH AFRICA, UNION OF, DEPARTMENT OF AGRICULTURE, DIVISION OF PLANT INDUSTRY. 664.85  
**Report of the Low Temperature Research Station Laboratory, Capetown, for the year June 1936-June 1937,** 1938, pp. 184.

Section A is devoted to the following :—The Port Elizabeth precooling store ; recording electrical thermometer outfits for precooling plants ; indicator electrical thermometer outfits for precooling stores ; commercial cold storage facilities in the Union—statistical ; and refrigerated truck transport of grapes. Section B deals with particular experiments, for which see separate abstracts.

1543. ZANZIBAR. 633.832  
**Annual Report of the Department of Agriculture for 1938,** 1939, pp. 38, 2s.

The initial progress of the investigation of the disease known as " sudden death of clove trees " is outlined and the phenomena associated with the disease are discussed. At the moment attention is turned to the possibility of attacking it through reproduction by grafting, especially root grafting. An attempt to increase the number of successful transplantings of clove seedlings by the application of a complete fertilizer to mulched and unmulched plants gave no significant results. An investigation into differences in oil content of clove buds derived from different trees disclosed sufficient variations to warrant a closer examination of this subject. It was shown that exposure of discarded clove stems to the weather until the more important crop of clove buds had been disposed of reduced their weight and therefore financial return and resulted in decreased eugenol content. The oil content of weathered stems was occasionally increased but not sufficiently so to offset the loss of eugenol.

1544. The annual reports and similar publications listed below have also been examined. Much of the horticultural research referred to in them has been dealt with more fully elsewhere and abstracted in Horticultural Abstracts.

**A.R. Dep. Agric. Assam for the year 1937-8,** 1938, pp. 206+3.  
 Rs. 2.7 or 3s. 8d.

**A.R. Dept. Agric. Basutoland for the report year ended Sept. 30,** 1938, pp. 77.

COCONUT RESEARCH SCHEME (CEYLON). 633.74

**Report and accounts of the Coconut Research Scheme for 1938.**

*Sessional Pap. Coconut Research Scheme (Ceylon)* 11, 1939, pp. 21, 25 Cents.

\* See also abstract 1322.

- Annu. Bull. divis. Repts. Dep. Agric. Fiji, 1938, 1939*, pp. 106, 2s. 6d.  
*Rep. Dep. Agric. Colony of The Gambia for period ending 31st May, 1939, 1939*, pp. 15, 2s.  
*Twelfth A.R. Agric. Res. Inst. N. Ireland, Hillsborough, Co. Down, for 1938-9*, pp. 45.  
*A.R. Supt. bot. For. Dept. Hong Kong for 1938*, pp. 17, 60 Cents.  
*Progr. Rep. Inst. Plant Industry, Indore, for the year ending May 31, 1938*, pp. 17.  
*Rep. Operations Dept. Agric. Madras Presidency for the year 1937-8, 1938*, pp. 64+8, 6 annas.  
*Rep. Subordinate Officers' Dep. Agric. Madras, for 1937-8, 1938*, pp. 182, Rs. 4.  
*A.R. Dep. Agric. Malta for 1937-8, 1939*, pp. 71.  
 MYSORE DEPARTMENT OF AGRICULTURE.  
*Mysore Agricultural Calendar for the year Pramadi, Mar. 22, 1939-April 8, 1940, 1939*, pp. 103.  
*Fifty-second A.R. Nebraska Agric. Exp. Stat. for 1938, 1939*, pp. 59.  
*A.R. Dep. Agric. N. Rhodesia for 1938, 1939*, pp. 26, 2s.  
*A.R. Dep. Agric. Nyasaland Protectorate, 1938, 1939*, pp. 96, 2s. 6d.  
 OHIO.  
*Fifty-sixth A.R. Ohio agric. Exp. Stat. for year ending June 30, 1937. Bull. Ohio agric. Exp. Stat. 592, 1939*, pp. 142.  
*A.R. Director Gdns. Straits Settlement for the year 1938, 1939*, pp. 14, \$1 or 2s. 4d.  
 COMMISSIONER OF AGRICULTURE, I.C.T.A., TRINIDAD.  
*Report of the Agricultural Department St. Kitts-Nevis, 1938, 1939*, pp. 60, 6d.

*Notice to readers.*

HORTICULTURAL ABSTRACTS IN WARTIME

It seems probable that nearly all the publications, including those issued in Germany, which have hitherto been available to the compilers of Horticultural Abstracts will—subject to a certain delay—still be available.

No drastic curtailment is, therefore, contemplated, though in view of possible demands on the staff of the Bureau in connexion with matters of urgent practical importance, it may be found necessary to make more use than before of authors' summaries.

If, later, economy necessitates a serious curtailment of abstracts, every effort will be made to ensure at least the noting of all important work.

INDEX TO FIRST TEN VOLUMES. *Preliminary Notice.*

Provided there is sufficient demand, it is proposed to issue a comprehensive author and subject index of the first ten volumes of Horticultural Abstracts in the spring of 1941.

It is thought that such an index in conjunction with Horticultural Abstracts should form a fairly comprehensive annotated bibliography of horticultural research during the last ten years and prove of considerable value to research workers.

The price will be approximately £1.

The editors of Horticultural Abstracts would welcome any comments on the proposal and assurances of support.





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## PUBLICATIONS STILL AVAILABLE, MARCH 1938

### QUARTERLY PUBLICATION

#### HORTICULTURAL ABSTRACTS.

Vol. I, 1931, No. 2, 1/6. Vol. II, 1932, No. 4, 1/6. Vol. III, 1933, to Vol. VII, 1937, 15/- a volume of 4/- a number.

### TECHNICAL COMMUNICATIONS

2. FIELD EXPERIMENTS IN HORTICULTURE. 1931. T. N. Hoblyn. 2/-.
3. INVESTIGATIONS ON THE STANDARDIZATION OF CITRUS TREES BY PROPAGATION METHODS. 1932. 2/-.
4. PROBLEMS OF FRUIT TREE NUTRITION. 1933. Dr. T. Wallace. 2/-.
5. THE "DEGENERATION" OF THE STRAWBERRY. 1934. D. Akenhead, R. V. Harris, G. H. Berkeley, A. M. Massee. 2/-.
6. THE NUTRITION AND MANURING OF SOFT FRUITS. 1936. Dr. T. Wallace. 2/-.
7. VEGETATIVE PROPAGATION OF TROPICAL AND SUB-TROPICAL FRUITS. 1936. G. St. Clair Feilden and R. J. Garner. 2/-.
8. HORTICULTURAL ASPECTS OF WOOLLY APHIS CONTROL, TOGETHER WITH A SURVEY OF THE LITERATURE. 1936. R. M. Greenslade. 2/6.
9. A REVIEW OF THE LITERATURE ON STOCK-SCION INCOMPATIBILITY IN FRUIT TREES, WITH PARTICULAR REFERENCE TO POME AND STONE FRUITS. 1937. G. K. Argles. 5/-.

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